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EXPERIMENT STATION RECORD.

VOL. 37. ABSTRACT NUMBER. NO. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Principles of agricultural chemistry. G. S. FRAPS (*Easton, Pa.: The Chemical Publishing Co., 1917, 2. ed., pp. 501, figs. 94*).—This is the second edition of the work previously noted (E. S. R., 30, p. 10). A number of additions and changes have been made which include some of the recent advances in the subject, especially with reference to soil organisms, nutritive value of protein, and productive value of feeds.

An introduction to the chemistry of plant products. P. HAAS and T. G. HILL (*London and New York: Longmans, Green & Co., 1917, 2. ed., pp. XII+111, figs. 5*).—This is the second edition of the work previously noted (E. S. R., 32, p. 803).

Due to the great advances made in the chemistry of plant pigments since the issue of the first edition, this section has been entirely rewritten. A few other minor additions and changes have been made and further references to the literature added.

The occurrence of mannite in silage and its possible utilization in the manufacture of explosives. A. W. DOX and G. P. PLAISANCE (*Science, n. ser., v. 45, 1917, No. 1182, pp. 192, 193*).—Analytical data obtained by the authors at the Iowa Experiment Station in the course of investigations on the fermentation processes that occur immediately after the ensiling of corn and the chemical products resulting therefrom show the presence of considerable amounts of mannite in various kinds of silage. The highest percentages of mannite were found in sunflower silage, cane silage, and an experimental corn silage to which sucrose had been added. It is indicated that the mother substance of the mannite is apparently sucrose or, more specifically, its fructose molety. The presence of the mannite was shown not to be a local phenomenon, since the samples of silage examined were obtained from several different States. Corn and cowpea silage, sweet clover silage, and ensiled corn stover plus sucrose contained no mannite.

A method of preparing quantities of mannite without special regard to quantitative yields and the use of its nitration product in the manufacture of explosives are noted.

See also a previous note by Manns (E. S. R., 1, p. 200).

The occurrence and significance of mannitol in silage. A. W. DOX and G. P. PLAISANCE (*Jour. Amer. Chem. Soc., 39 (1917), No. 9, pp. 2078–2087*).—This is a more detailed account of the material noted above.

The occurrence of l-leucin in sweet clover silage, G. P. PLAISANCE (*Jour. Amer. Chem. Soc., 39 (1917), No. 9, pp. 2087, 2088*).—In the examination of sweet clover silage for mannite by the author, at the Iowa Experiment Station, no evidence of the substance was found. Instead a white substance crystallized in little round masses, which after recrystallization from dilute alcohol was identified as l-leucin. In the samples of sweet clover silage examined leucin was recovered in amounts ranging from 0.4 to 1 per cent of the dry material.

The action of acids on the rotatory power of sucrose and invert sugar in the presence of soluble salts, E. SAILLARD (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 8, pp. 116–118*).—Data obtained in connection with work on beet molasses show that sulphurous acid and acetic acid do not change the rotatory power of sucrose in the presence of sodium chlorid. These acids do, however, diminish the rotation of invert sugar in the presence of sodium chlorid with or without the addition of hydrochloric acid. Hydrochloric acid increases the polarization of a solution of invert sugar in the presence of salt. The solutions of invert sugar containing salt and sulphurous acid yield an unstable polarization because of the easy loss of part of the dissolved gas. Carbon dioxid does not influence the rotation of solutions of sucrose or invert sugar, undoubtedly because of its slight solubility.

Glycolytic properties of muscular tissue, R. HOAGLAND and C. M. MANSFIELD (*Jour. Biol. Chem., 31 (1917), No. 3, pp. 501–517*).

The function of muscular tissue in urea formation, R. HOAGLAND and C. M. MANSFIELD (*Jour. Biol. Chem., 31 (1917), No. 3, pp. 487–499*).

Determination of carbonates in limestone and other materials, J. F. BARRIS (*Jour. Indus. and Engin. Chem., 9 (1917), No. 8, pp. 786, 787, fig. 1*).—Essentially noted from another source (E. S. R., 37, p. 616.)

Insoluble phosphoric acid in organic base goods, E. O. THOMAS (*Jour. Indus. and Engin. Chem., 9 (1917), No. 9, p. 865*).—Analytical data are submitted from which it is concluded that in the determination of citrate insoluble phosphoric acid the official method gives the true value of acid phosphate, but that in the analysis of materials of the character of acidulated garbage tankage some modification should be used.

The decomposition of dilead arsenate by water, C. C. MCDONNELL and J. J. T. GRAHAM (*Jour. Amer. Chem. Soc., 39 (1917), No. 9, pp. 1912–1918, figs. 2*).—Experimental data obtained in the study show that dilead arsenate is decomposed by water. The reaction is represented by the the equation

$$5PbHAsO_4 + HOH \rightleftarrows Pb_4(PbOH)(AsO_4)_3 + 2H_3AsO_4.$$

The reaction proceeds with the liberation of arsenic acid and the solution of a very small quantity of lead. Equilibrium is reached while the concentration of arsenic acid is very low. If the water is constantly changed, however, the reaction proceeds until the residue is converted to a definite basic lead arsenate (hydroxy mimetite, $Pb_4(PbOH)(AsO_4)_3.H_2O$.

Allen's commercial organic analysis, edited by W. A. DAVIS (*Philadelphia: P. Blakiston's Son & Co., 1917, 4. ed., rev., vol. 9, pp. XVIII+836, figs. 18*).—This is a supplementary volume to the work previously noted (E. S. R., 30, p. 309) which brings the text, especially that of the earlier volumes, up to date. The chapters included are alcohols; malt and brewing materials; wines and spirits; yeast; neutral alcoholic derivatives; sugars; starch and its isomerids; paper and paper-making materials; aliphatic acids; fixed oils, fats, and waxes; special characters and modes of examining fats, oils, and waxes; butter fat; lard; linseed oil; soaps; glycerol; cholesterol; wool, grease, and cloth oils; hydrocarbons; bitumens; naphthalene and its derivatives; phenols; aromatic acids; resins; india rubber, rubber substitutes, and gutta-percha; essential

oils; special characteristics of essential oils; tannins; analysis of leather; analysis of coloring materials; coloring matters of natural origin; coloring matters in foods; printing inks; inks; amins and ammonium bases; anilin and its allies; the naphtylamins and their allies; the vegetable alkaloids; volatile alkaloids; estimation of nicotin; aconite alkaloids; atropin and its allies; opium alkaloids; strychnos alkaloids; cinchona alkaloids; berberin and its associates; caffein, tea, and coffee; other vegetable alkaloids; glucosids; glucosidal bitter principles; animal bases; animal acids; lactic acid; glycogen and its derivatives; enzyms; proteins; vegetable proteins—flour; proteins of milk; milk products; albuminoids; meat and meat products; appendix; and an appendix.

A complete author and subject index of the entire work is included in the volume.

New apparatus for colorimetry, E. Moreau (*Ann. Falsif., 10 (1917), No. 109, pp. 235-237, fig. 1*).—A simple apparatus for routine analysis and its manipulation are described. It consists essentially of two colorimetric tubes, one of which is attached at its lower end a piece of rubber tubing which is connected to a leveling bulb. This tube is used for the standard color solution, and by this arrangement the volume can be readily changed until the color corresponds with that of the unknown sample.

The calculation of the results is described.

Discontinuous extraction processes, L. F. Hawley (*Jour. Indus. and Engin. Chem., 9 (1917), No. 9, pp. 866–871*).

A simplified microcombustion method for the determination of carbon and hydrogen, L. E. Wise (*Jour. Amer. Chem. Soc., 39 (1917), No. 9, pp. 2055–2068, fig. 1*).—A modification of the Pregl[1] microcombustion method for the determination of carbon and hydrogen, in which 11- to 22-mg. samples are used and which does not require the use of a microbalance, is described. A sensitive analytical balance has been found to yield satisfactory results. The drying train of the original method has been modified, and the technique used in weighing and in carrying out the combustion has also been modified and standardized.

Analytical data obtained in the combustion of pure substances containing carbon, hydrogen, and oxygen indicate that the accuracy of the micromethod is comparable to that of the ordinary macrocombustion. Preliminary data indicate that the procedure, without further modifications, may be applicable to the microanalysis of a variety of nitrogenous organic compounds. The limitations and possible applications of the method are briefly discussed.

The possibilities and limitations of the Duclaux method for the estimation of volatile acids, L. J. Gillespie and E. H. Walters (*Jour. Amer. Chem. Soc., 39 (1917), No. 9, pp. 2027–2055, figs. 3*).—The authors have studied the Duclaux method in detail and have stated and verified the laws which must be assumed to calculate the results of analyses. Algebraic and graphic methods for the computation of results for mixtures of two or three acids have been described and the algebraic calculation for four or more acids indicated. Application of the methods to known mixtures shows that mixtures of two or three acids may be quantitatively analyzed without too great error. The errors, however, are in general too large for mixtures of four acids.

Data obtained show that the errors of the method are not proportional to the quantities of acid present. Mixtures containing four or more acids in significant quantities must be fractionated before applying the method into mixtures containing only three acids. "In order to apply the Duclaux method

[1] [Abderhalden's] Handb. Biochem. Arbeitsmethod., 5 (1912), pt. 2, pp. 1307–1356.

to unknown mixtures it is necessary to establish that not more than three acids are present in significant quantities. This fact established, a distillation by the Duclaux method should suffice for both qualitative and quantitative analysis of the mixture. The methods of calculation do not depend on the form of the laws governing the rates of distillation of pure acids in aqueous solution, and therefore do not necessarily depend on the mode of distillation. The calculations may therefore be applied to distillations made in other ways, for instance, to steam distillations at constant volume. It is merely necessary to conduct all distillations both of pure acids and of mixtures in the same manner."

A modification of the McLean-Van Slyke method for the determination of chlorids in blood, G. L. FOSTER (*Jour. Biol. Chem., 31 (1917), No. 3, pp. [481]-485*).—The method previously described (E. S. R., 34, p. 507) has been modified in that a freshly prepared 25 per cent solution of metaphosphoric acid is used for coagulating the proteins. The procedure is described as follows:

To 2 cc. of the sample in a 25-cc. volumetric flask, 20 cc. of water is added and then slowly, with stirring, 1 cc. of a freshly prepared solution of metaphosphoric acid. The flask is filled to the mark, well shaken, and allowed to stand for ten minutes with occasional agitation. The contents of the flask are then filtered and 10 cc. of the filtrate used for the determination, as described in the original method.

Studies of acidosis.—II, A method for the determination of carbon dioxid and carbonates in solution, D. D. VAN SLYKE (*Jour. Biol. Chem., 30 (1917), No. 2, pp. 347–368, figs. 4*).—A simple one-piece apparatus for the determination of carbon dioxid or carbonates in water solutions and its manipulation are described.

The principle of the method is that of vacuum extraction. The apparatus was designed especially for analysis of 1-cc. samples of blood plasma, but is indicated as being applicable to aqueous solutions in general, as well as for the determination of dissolved gases other than carbon dioxid. A microapparatus with which the carbon dioxid content of 0.2 cc. of plasma can be determined with an accuracy of one volume per cent, designed on the same principle, is also described. The entire analysis is performed at room temperature and requires only about three minutes.

The calculation of the results is described in detail.

Methods for the determination of saccharin in food products, A. BOSIS (*Ann. Falsif., 10 (1917), No. 103–104, pp. 210–218*).—A general review of the procedures for extracting saccharin and purifying the residue, and of methods of identification and quantitative determination.

Application of the cryoscopic method for determining added water in milk, J. T. KEISTER (*Jour. Indus. and Engin. Chem., 9 (1917), No. 9, pp. 862–865*).—It is concluded from the study that "the freezing-point figure of milk is the most constant one yet obtained and the safest basis upon which to draw conclusions as to the presence or absence of added water." Water added to fresh milk in excess of 5 per cent was detected with certainty by the freezing-point method. The use of sufficient formaldehyde for preservation was found to lower the freezing point. The test should be applied to the milk before any marked increase in acidity has taken place, since increased acidity affects the final results.

The freezing-point figures of the milk of 16 individual cows are submitted in tabular form, and the apparatus for determining the freezing point and its manipulation are described.

The determination of fat in certain milk products, C. K. FRANCIS and D. G. MORGAN (*Jour. Indus. and Engin. Chem., 9 (1917), No. 9, pp. 861, 862*).—Essentially noted from another source (E. S. R., 37, p. 507).

The estimation of unsaponifiable matter in oils, fats, and waxes, J. M. WILKIE (*Analyst, 42 (1917), No. 495, pp. 200-202*).—The following modification has been found more satisfactory than the procedure usually recommended for the determination of unsaponifiable matter.

A 5-gm. sample is saponified with 12.5 cc. twice-normal alcoholic potassium hydroxid for one-half to one hour, transferred to a separatory funnel with 50 cc. of water, and extracted with 40, 30, and 30 cc. portions of ether. The ether extracts are combined in a separatory funnel containing about 20 cc. of water. Without shaking, the wash water is run off, the ethereal solution then washed by shaking vigorously with 2, 5, and 30 cc. portions of water, evaporated to dryness, and the residue weighed.

For solid waxes, such as beeswax, a sample of 0.5 gm. is used, and in the saponification a few grams of castor oil is added. The procedure is then the same as described above, with the exception of the addition of 40 cc. of water at 70° C. instead of 50 cc. of cold water, and the extraction with 50, 40, 40, and 30 cc. portions of ether. A suitable correction for the known unsaponifiable content of the castor oil is made.

Data submitted indicate the accuracy of the modified procedure.

The thermal values of the fats and oils.—II, The sulphuric acid or Maumené number, J. W. MARDEN and M. V. DOVER (*Jour. Indus. and Engin. Chem., 9 (1917), No. 9, pp. 858–860, figs. 2*).—Continuing previous studies (E. S. R., 34, p. 803), the authors propose a method for the calorimetric determination of the sulphuric acid number of fats and oils. The method is indicated as being simple, a single determination requiring only about one-half hour, and accurate to 0.5 per cent. The rise in temperature on addition of the acid, multiplied by the heat capacity of the system divided by the weight of the oil, gives the sulphuric acid number in calories per gram of sample. The concentration of the acid was found to affect the results, but a variation in the amount used had little effect so long as the concentration remained constant. The importance of the use of a standard concentration of acid in the test is indicated.

The construction of an inexpensive apparatus (calorimeter) and its standardization are described.

Tabulated data of the heats of reaction of 20 oils examined are submitted.

The pasteurization and biorization of fermented and unfermented grape and fruit juices, W. J. BARAGIOLA (*Schweiz. Apoth. Ztg., 55 (1917), No. 29, pp. 389, 390*).—The disadvantages of the pasteurization of grape and fruit juices are discussed, and some preliminary results of the sterilization of these juices with the biorizator (E. S. R., 31, p. 276; 35, p. 677) are submitted. The results obtained were entirely satisfactory, and no cooked flavor was imparted to the product as is the case when the juices are pasteurized. Some slight modifications of the biorizator were, however, found necessary.

It is intended to continue the study.

Aldehydes in wine, J. LABORDE (*Ann. Inst. Pasteur, 31 (1917), No. 5, pp. 345–352*).—From the results of the study reported it is concluded that the catalytic and physiological agents which are responsible for the formation of aldehydes in wine exercise their greatest influence in young wines during storage in casks. Under these conditions the wine is more or less in contact with the air. There are, however, certain factors which inhibit the production of aldehydes and which are favored by the exclusion of air. This condition is

indicated as being the reason for the small quantity of aldehyde in normally stored red wine. Formation of aldehydes in red wine is not considered to exercise any perceptible influence on the precipitation of tannin substances.

It is indicated that the aldehydes exercise not only a transitory influence but one which is wholly unfavorable to the aroma of red wines stored in casks. It is equally injurious to white wines, especially those which are deficient in sulphurous acid. Only those special wines in which part of the quality depends on an energetic oxidation are benefited by the formation of aldehydes, as it is favorable to the development of their characteristic aroma.

The data obtained in the study are submitted in tabular form and discussed.

Chemical composition of "separated musts," W. J. BARAGIOLA and J. B. KLÉBER (*Landw. Jahrb. Schweiz, 31 (1917), No. 3, pp. 303–314*).—Analytical data of so-called separated musts prepared from the juice of overripe fruits are submitted and discussed.

The juice of such fruits is deficient in tannic acid and consequently turbid and proper fermentation does not take place in such musts. They may be clarified, however, by proper treatment and are then known as separated musts the fermentation of which proceeds as satisfactorily as that of a normal must.

Sauerkraut industry of the United States, L. A. ROUND and S. C. CADY-SMITH (*Canner, 44 (1917), Nos. 16, pp. 48, 50; 17, pp. 48, 50; 18, pp. 52, 54; 19, p. 52; 20, pp. 48, 50*).—This is a general discussion of the conditions necessary for the successful fermentation of sauerkraut.

Utilization of frozen and decayed potatoes, SCHRIBAUX (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 26, pp. 716–718*).—The use and value of frozen and decayed potatoes as a stock food and in some instances as human food is noted. A procedure which can be easily carried out on the farm, and which consists of washing, pulping, and drying the pulp, is briefly outlined.

A moderate-sized evaporator for fruits and vegetables, A. F. BARSS (*Oreg. Agr. Col., Ext. Bul. 213 (1917), pp. 4, figs. 4*).—This bulletin describes the construction of a simple and efficient evaporator for drying fruits and vegetables.

Bacteriological study of the natural coagulation of the latex of Hevea brasiliensis, DENIER and VERNET (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 3, pp. 123–126*).—The authors have isolated 26 species of facultative aerobes and anaerobic organisms from the natural coagulation of the latex. The organisms are indicated as being present in great numbers. The cultural and morphological characters of the organisms isolated are described.

Certain precautions necessary for a perfect coagulation of the latex are briefly outlined.

More about rice hull carbon, F. ZERBAN (*La. Planter, 59 (1917), No. 6, pp. 93, 94*).—This article reports the results of sugarhouse tests in which the new rice hull carbon was used for clarification. The results are considered entirely satisfactory and, while only of a preliminary nature, are indicated as having established the value of the new product.

Laboratory experiments carried out at the Louisiana Sugar Experiment Station have shown the rice hull carbon, properly prepared and purified, to have a very high decolorizing and deodorizing power which exceeds many times that of ordinary bone black. Its use extends over a large range. The impurities taken up by the carbon can be easily removed and the original decolorizing power restored.

Local processes of coconut oil extraction in the Philippines, C. A. GARDNER (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 1, pp. 27–31, figs. 6*).—This is a brief description of the machines and methods employed in the extraction of coconut oil in small mills owned and operated by the individual farmer.

METEOROLOGY.

Monthly Weather Review (*U. S. Mo. Weather Rev., 45 (1917), Nos. 5, pp. 265–296, pls. 12, figs. 14; 6, pp. 267–333, pls. 20, figs. 3*).—In addition to weather forecasts, river and flood observations, and seismological reports for May and June, 1917; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during May and June, 1917; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 5.—City Smoke and Daylight Illumination Intensities (illus.), by H. H. Kimball and A. H. Thiessen; On Horizontal Halos (illus.), by Y. Tsuji (reprinted); Solar Halo at Vicksburg, Miss., April 24, 1917, by W. E. Barron; Halo Phenomena April 8, 1917, at York, N. Y., by M. N. Stewart; Summer Types of Rainfall in Upper Pecos Valley (illus.), by C. Hallenbeck (see p. 808); Sources of Organic Matter, by W. L. McAtee (see p. 808); Records at the Ohio Meteorological Observatory Compared with Those at the Government Building, Cincinnati (illus.), by W. C. Devereaux; Winter Indoor Aridity in Topeka, Kans., by S. D. Flora; The Preparation of Precipitation Charts, by W. G. Reed and J. B. Kincer; Some New Instruments for Oceanographical Research—Supplemental Note (illus.); Hail Squall of May 1, 1917, and Accompanying Weather, Baltimore, Md., by L. K. Hirshberg; Photographs of the Devils Lake, N. Dak., Tornado of August 20, 1911 (illus.), by H. E. Simpson; and Some Researches in the Far Eastern Seasonal Correlations.—Second Note (abs.), by T. Okada (reprinted).

No. 6.—Peculiar Streak in Line with Kite Wire, by B. J. Sherry; The World's Air Routes and Their Regulation, by Lord Montagu, of Beaulieu (reprinted abs.); New England Snowfall (illus.), by C. F. Brooks (see p. 807); The Cold Spring of 1917 (illus.), by P. C. Day (see p. 808); Some Aspects of the Cold Period, December, 1916, to April, 1917, by R. C. Mossman (reprinted abs.); Accidental Pressure Variations in the United States, by A. J. Henry; The Tornadoes and Windstorms of May 25–June 6, 1917 (illus.), by H. C. Frankenfield; Meteorological Courses for Aeronautical Engineers.—[Syllabus of 10 lectures by R. DeC. Ward]; Some Researches in The Far Eastern Seasonal Correlations.—Third Note, by T. Okada (abs.); Kristian Birkeland, 1867–1917, by C. Chree (reprinted); Use of the Divining Rod in the Search for Hidden Springs, by O. E. Meinzer (reprinted); Desiccation of Africa, by R. L. Harger (reprinted abs.); and Effect of Humidification of a School Room on Intellectual Progress of the Pupils, E. L. Thorndike and P. J. Kruse (abs.).

Free-air data at Drexel Aerological Station.—April, May, and June, 1916, W. R. BLAIR ET AL. (*U. S. Mo. Weather Rev. Sup. 7 (1917), pp. 51, pls. 3*).—Detailed tabulated data are given on temperature, pressure, humidity, wind, and potential obtained in 140 free-air observations during a period of 91 days in which the mean altitude attained was 2,339 meters (7,672 ft.) above sea level.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER ET AL. (*Massachusetts Sta. Met. Buls. 343–344 (1917), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July and August, 1917, are presented. The data are briefly discussed in general notes on the weather of each month.

New England snowfall, C. F. BROOKS (*U. S. Mo. Weather Rev., 45 (1917), No. 6, pp. 271–285, pl. 1, figs. 29*).—This is an amplification of an article which has already been noted from another source (E. S. R., 37, p. 16).

Summer types of rainfall in upper Pecos Valley, [N. Mex.], C. HALLENBECK (*U. S. Mo. Weather Rev., 45 (1917), No. 5, pp. 209–216, figs. 5*).—From a study of data showing the rainfall, May to September, inclusive, for 12 years, 1905–1916, the author concludes that, while the summer rains of this portion of the United States are essentially daytime rains, there is a preponderance of night rains over the limited area occupied by the upper half of the Pecos Valley, due wholly to the occurrence of a peculiar type of nonconvective rainfall which is described.

Showers of organic matter, W. L. MCATEE (*U. S. Mo. Weather Rev., 45 (1917), No. 5, pp. 217–224*).—This article describes in some detail the various kinds of animal and vegetable matter, alive and dead, which are transported and distributed through the atmosphere. It is stated that the more spectacular phenomena of this kind, such as the distribution of live animals of various kinds, are the least important from the standpoint of the distribution of life. "The rains of larger animals have attracted much attention and excited wonder, but in many cases the animals have been dead; in others they were doomed to die because of falling in an unsuitable environment. Not often are all the conditions propitious for the species to secure a new foothold.

"The unobtrusive, but steady and widespread movement of minute eggs and spores by the atmosphere, however, is of great importance in distribution because these organic bodies are adapted to survive such transport; their numbers are so great and their dispersal so wide that some of them will necessarily fall in favorable places. The chances are, in fact, that every suitable environment will be populated."

The cold spring of 1917, P. C. DAY (*U. S. Mo. Weather Rev., 45 (1917), No. 6, pp. 285–289, figs. 4*).—The unseasonable cold weather which persisted to an unusual degree in nearly all portions of the country during a period of three weeks, beginning about April 24 and continuing to the middle of May, is described. Discussing the agricultural effects of the low temperature, the author states that "while low temperatures retarded the planting and germination of corn, cotton, and other spring crops, and delayed the growth of gardens and truck over the southern districts, the cool weather was not unfavorable to winter wheat and other hardy cereals which are reported to have greatly improved during the month. Likewise fruit buds which had largely remained dormant escaped damage from the prevailing cold, although severe frosts were not experienced as late in the month as in some previous years. However, the cool weather was unfavorable in that it caused crops generally to be backward, which at the end of May were estimated to be from one to three weeks late throughout the country. This increases the liability to damage by fall frost for such crops as have a long period of growth."

SOILS—FERTILIZERS.

Relation of movement of water in a soil to its hygroscopicity and initial moistness, F. J. ALWAY and G. R. MCDOLE (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 8, pp. 391–428, figs. 2*).—In experiments conducted at the Nebraska Experiment Station "17 soils, ranging from a coarse sand with a hygroscopic coefficient of 0.6 to a silt loam with one of 13.3, were placed in cylinders in three different degrees of moistness, 0.5, 1, and 1.5 times the hygroscopic coefficient, 1 in. of water was applied to the surface, the rate of movement during five days observed, and finally the moisture distribution at the end of this period determined.

"When placed in the cylinders the finer-textured soils showed a lower apparent specific gravity than the coarser, but within groups of somewhat similar texture this value was found to show no direct dependence upon the hygroscopicity.

"The moisture content of the moistened layer, even at the end of the first hour, was only from one-half to two-thirds the maximum water capacity, which shows that the latter has little significance as a direct index of the moisture retentiveness of a soil. The moisture content of the moistened layer fell much more rapidly with the finer-textured soils, at the end of 24 hours it being only between two and three times the hygroscopic coefficient, while in the coarser soils it varied from three to ten times the coefficient. At the end of the five days equilibrium had been practically attained in the finer-textured soils, but in the coarser ones this was far from being the case. The coarser the soil the more slowly was equilibrium reached.

"The rate of penetration showed little dependence upon the hygroscopicity, but was definitely affected by the moistness, the higher the initial moisture content of any soil within the limits employed the more rapid being the downward movement of water. The distance of penetration during the five days following the application of water increased with the initial moistness of the soil, but was not closely related to the hygroscopicity, owing partly to the slowness with which equilibrium is attained in the coarser soils.

"With the finer-textured soils the water content of the moistened layer was not distinctly affected by the initial moistness, but with the coarser members the drier the soil the wetter was the moistened layer. Provided that a period of high evaporation is to precede the next rain, the character of the weather immediately following a rain will have a greater effect upon the loss of moisture by evaporation in the case of a coarse than of a fine-textured soil.

"Glass tubes were filled with the same soils in the same three degrees of moistness and the lower ends placed in contact with water kept at a constant level. The rate of rise during eight or ten days was observed and the moisture in the uppermost layer of the moistened portion of the soil column at the end of this period determined. At first the rise was most rapid in the soils of low hygroscopicity, but the difference gradually lessened until those of intermediate hygroscopicity were in the lead. There was no definite dependence of the rise upon the hygroscopicity. No definite dependence of the rate of rise upon the initial moistness was shown, it being, in the case of the three moisture conditions studied, generally most rapid in the moistest condition and slowest in the intermediate.

"All the finer-textured soils showed the highest percentage of moisture at the head of the advancing moist layer when used in the driest condition, but the coarser members showed no difference. The moisture content of this moist layer shows a rather constant relation to both the hygroscopic coefficient and the moisture equivalent, being similar to the moisture retentiveness of the same soils.

"The relative rates and distances of penetration in the different soils are not similar to the relative rates and heights of capillary rise."

Origin of alkali, R. STEWART and W. PETERSON (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 7, pp. 331–353*).—In connection with the authors' well-known studies at the Utah Experiment Station of the origin of niter spots in soils (E. S. R., 36, p. 423), analyses were made of some 400 representative samples of sandstone, shale, "alkali," clay, and an ash consisting of a mixture of dry dust with crystals of "alkali" found just under the clay crust on the most affected parts.

"These investigations show a marked amount of water-soluble salts or alkali in the undistributed country rock with local accumulation wherever the movement of the underground water has caused a local concentration by seepage through the rock and deposition by evaporation. There is a marked variation in the amount of salts occurring in the country rock in any given geological series, but uniformly high results have been obtained at widely separated sections of the country, such as those found at Grand Junction, Colo.; Emery and Vernal, Utah; and Lyman, Wyo. There is a marked concentration of nitrates and alkali in the ashlike and alkali deposits in the uncultivated areas."

A tabulated summary of the average alkali material found in the country rock "brings clearly to mind the fact that in a widely disseminated form there are in the shales and sandstones of the Cretaceous and Tertiary of Utah, Colorado, and Wyoming enormous deposits of soluble salts consisting of the sulphates, chlorids, nitrates, and bicarbonates of calcium, magnesium, and sodium. In certain local areas these salts become concentrated so as to produce native alkali, or 'niter spots,' by the movement of the underground water without the instrumentality of the irrigation ditch. Wherever the shale is highly impregnated with the salts the evaporation of the water deposits the alkali salts on the surface in the form of an ashlike powder."

A preliminary soil census of Alabama and west Florida, R. M. HARPER (*Soil Sci., 4 (1917), No. 2, pp. 91–107, fig. 1*).—This census is based on all the soil surveys of the Bureau of Soils of the U. S. Department of Agriculture for Alabama and west Florida published up to the end of 1916.

Soil survey of the Healdsburg area, Cal., E. B. WATSON, W. C. DEAN, C. J. ZINN, and R. L. PENDLETON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 59, pls. 5, fig. 1, map 1*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 222,720 acres in the central and northern parts of Sonoma County, in western California. The area consists of relatively level valley lands and low hills surrounded by higher hills which are mainly nonarable.

"The soils of the Healdsburg area include those of residual origin, those derived through weathering from old unconsolidated valley-filling deposits, and those of recent alluvial origin." Including rough mountainous land and riverwash, 30 soil types of 15 series are mapped, of which rough mountainous land covers 31.8 per cent, Goldridge fine sandy loam 12.8 per cent, and Madera loam 6.6 per cent of the area.

Soil survey of Cumberland County, Me., C. VAN DUYNE and M. W. EVES (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1915, pp. 92, figs. 2, map 1*).—This survey deals with the soils of an area of 545,920 acres in southern Maine, the physiographic features of which are those of an uneven country with little or no systematic arrangement of its hills, valleys, and plains. Only small local areas are poorly drained.

With reference to origin, the soils of the area are classed as "soils derived from glacial till, from terrace deposits, from estuarine and glacial-lake deposits, from alluvial flood-plain deposits, from accumulations of organic matter, and miscellaneous nonagricultural. In all, 10 series with 21 soil types, 4 phases, and 4 miscellaneous types have been mapped." Of these the Gloucester sandy loam, Orono silt loam, Gloucester stony sandy loam, and the Merrimac sandy loam cover 27.3, 15.6, 15.5, and 11.5 per cent of the area.

The formation and characteristics of Massachusetts peat lands and some of their uses, A. P. DACHNOWSKI (*Trans. Mass. Hort. Soc., 1917, pt. 1, pp. 22–*

... This is an address delivered January 27, 1917, which was illustrated by ... of lantern slides and samples of peat material, and is apparently ... to give the results of a reconnoissance of the peat lands of Massa- ... soils. It is concluded that the inequality in the character of the peat ... encountered and in the strata of their materials renders a more detailed ... advantageous in their agricultural utilization.

"Information concerning the seasonal variations in the water table, the ... of the salt constituents, and the circumstances in the field conditions ... lead to the augmentation or diminution of soluble constituents is of prime ... importance, the effect of any accumulation of iron compounds especially requiring ... tion in certain cases. The relation of cropping system to the several kinds ... peat lands if ignored would be to the disadvantage of the real agricultural ... of certain peat lands. Field trials are the more correct means under the ... existing conditions on the peat lands to determine the choice of crop varieties, ... mixtures, etc., and the cultural practices to be followed."

The oxidizing power of some soils in Deli, J. A. HONING (*Bul. Deli Proefst. Medan, No. 8 (1917), pp. 8*).—Tests of the Gerretsen method of determining the oxidizing power of soils (E. S. R., 35, p. 624) on the dry soils of Deli proved it to be impracticable and to give contradictory results on these soils. Frequently the hydrogen iodid value was high for samples taken at 1 or 2 ft. depth and low for surface soils having a high percentage of humus. The failure of the method on the nonirrigated soils of Deli is attributed to the presence of large quantities of humus and the irregular distribution of the ferric iron.

Variation in the chemical composition of soils, W. O. ROBINSON, L. A. ... and W. H. FRY (*U. S. Dept. Agr. Bul. 551 (1917), pp. 16*).—This ... presents complete analyses of 45 samples of soil, representing 18 dis... soil types distributed in four provinces. These, with the analyses of 24 ... previously noted (E. S. R., 31, p. 719), are discussed with reference to ... of all samples, variation in composition within a soil province, varia... of the same type, and the bearing of the limit of error in analysis on the ... of analytical data.

"It is thought that the analyses discussed represent nearly the extremes in ... of soils in the regions in which the samples were taken. Marked ... in composition of soils from the same province are pointed out. ... shown that some samples of the same type differ considerably in chemical ... It is also shown that some soils of different types may resemble ... other in chemical composition as closely as different samples of the same ... It is pointed out that the unavoidable error in analytical operations is ... many cases of such magnitude that when analyses are stated in pounds per ... differences of several hundred pounds of some constituents are not ...

A soil sampler for bacteriological and chemical purposes, J. R. NELLER (*Soil Sci., 4 (1917), No. 2, pp. 109–113, figs. 5*).—A soil sampler, devised at the New Jersey Experiment Stations, is described and diagrammatically illustrated.

The sampling tube is 3½ ft. long and has an inside diameter of 1¼ in. It is ... into two parts, *a* and *b*. Piece *a* is 11 in. long and has a point made so ... the core slides easily up through the tube. The inner shoulder above the ... edge is about ⅛ in. wide. Piece *a* is attached to piece *b* by means of a ..., or groove and key joint, made so that it closes and tightens when the ... part of the tube is turned to the right. A slight twist to the left enables ... to detach the lower piece and remove the core of soil. The shoulders of

this joint taper slightly into each other so as to come together and take up any looseness resulting from wear. The cleaning tube has an outside diameter that permits it to slip easily but snugly through the surface shield.

The use of the sampler is also described.

The influence of available carbohydrates upon ammonia accumulation by microorganisms, S. A. WAKSMAN (*Jour. Amer. Chem. Soc., 39 (1917), No. 7, pp. 1505–1512*).—Experiments conducted at the University of California on the influence of carbohydrates on ammonia and amino nitrogen accumulations by soil microorganisms are reported. The organisms studied were *Aspergillus niger* and *Citromyces glaber*, isolated from soil by the author.

It was found that "the effect of sugar on the accumulation of ammonia by *A. niger* is marked. Where the sugar was absent the organism made a rather slow growth, as shown by the weight of the mycelium, but the ammonia accumulated in large quantities from the third till the sixteenth day, the amount increasing rapidly, so that on the sixteenth day about a half of the total nitrogen of the medium was in the form of ammonia. Where the sugar was present the ammonia accumulated only in very small quantities, while the weight of the mycelium increased rapidly until the seventh day, when autolysis set in and the weight of the fungus body began to decrease. The amount of ammonia accumulated was small when the organism grew rapidly; but as the maximum of growth was reached, which was also accompanied by the utilization of all the sugar in the medium, the ammonia began to accumulate very rapidly."

The same results were obtained with *C. glaber*, the excess of sugar corresponding to a decrease in the amount of ammonia present in the medium. "In the production of amino nitrogen *C. glaber* behaves in an entirely different manner from *A. niger;* it was found that many organisms which are not able to reduce the proteins to ammonia, whether in the presence or absence of available carbohydrates, may split the proteins into amino acids which accumulate in the medium.

"This experiment shows again that, when available carbohydrates are present, the organism will utilize all the nitrogen split off from the protein for its own metabolism; while in the absence of available carbohydrates, or where these have been used up, the protein molecule will be attacked not only for its nitrogen content but also for its carbon content."

Effect of paraffin on the accumulation of ammonia and nitrates in the soil, P. L. GAINEY (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 7, pp. 355–364*).—In experiments at the Kansas Experiment Station paraffin and Parowax in thin shavings and paraffin oil were added to a soil having a vigorous ammonia and nitrate-forming flora at the rate of 2 gm. per 100 gm. of soil. In certain cases also the insides of the 500-cc. bottles used in the incubation test were paraffined or parowaxed. In certain cases no additions were made of nitrogen or calcium carbonate. In other cases nitrogen was added in the form of cottonseed meal and ammonium sulphate at rates of 50 mg., and calcium carbonate at the rate of 0.5 gm. per 100 gm. of soil.

In the tests in which no nitrogen was added, and regardless of whether calcium carbonate was added, paraffin in the three forms used not only inhibited the accumulation of ammonia and nitrate nitrogen, but caused that which was present at the beginning of the experiments to disappear. This effect was maintained for 13 weeks and even longer, and regardless of whether the paraffin was intimately mixed with the soil or simply lined the inner wall of the container.

When nitrogen was added in the form of cottonseed meal, there was vigorous formation of ammonia and nitrate in the presence of paraffin, but these disappeared so rapidly that "it is impossible to say whether such formation was equally as rapid as in the absence of paraffin." In no case did the quantity of ammonia or nitrate nitrogen, where Parowax or paraffin had been added, approach the quantity in the controls at the end of two weeks. The inhibitory effect of the paraffin oil was more marked than that of other forms of paraffin during the early stages of incubation. The effect of the oil appears to be quite largely an inhibition of formation rather than a disappearance of ammonia and nitrate nitrogen.

"When ammonium sulphate was added to the soil either with or without calcium carbonate, all three forms of paraffin exerted a very marked effect upon the accumulation of nitrate nitrogen. The decreased accumulation of nitrate nitrogen was not so evident during the early stages of incubation except with paraffin oil. With the oil the effect again seems to be to retard nitrification, the quantity of active nitrogen [NO_3+NH_3] approaching very closely that in the controls. Parowax and paraffin, however, not only decrease the accumulation of nitrate nitrogen but also bring about a large reduction in the quantity of active nitrogen. The reduction in active nitrogen occasioned by the various forms of paraffin is not nearly so rapid where ammonium sulphate was added as where nitrogen in the form of cottonseed meal was added."

Further experiments with larger amounts of soil in paraffined 2-gal. earthenware containers showed that "no ordinary sized container used for cultural purposes can be protected with a coating of paraffin, as in these experiments, without the available nitrogen content throughout the whole mass of soil being affected."

Nitrates and nitrification in relation to cultural practices and plant growth, H. A. NOYES (*Abs. Bact., 1 (1917), No. 1, pp. 38, 39*).—A summary is given of the first two years' results of soil bacteriological investigations which are being conducted in an experimental orchard where different cultural practices are under direct comparison. The objects of these investigations are first, to find out if the behavior of the trees can be directly correlated with the activities of the bacteria in the soil, and second, to determine the effect of the activities of the bacteria on the soil.

"The results are as follows: The nitrates in the field correlate with tree growth (circumference gains). The lower nitrate content under field conditions does not mean lower nitrate content after incubation. The field nitrates when compared with the nitrates after incubation give the nitrifying efficiency of the organisms under field conditions." It is concluded that "knowledge of the nitrate content of field soil may throw more light on the activities of nitrifying bacteria than the nitrification test itself."

A program of soil improvement for New York State, E. O. FIPPIN (*N. Y. State Col. Agr., Cornell Univ. Ext. Bul. 15 (1917), pp. 499–534, figs. 5*).—"The purpose of this bulletin is to point out the primary elements of a comprehensive system of soil improvement, and to propose a program of work that will coordinate and unify, so far as that is now practicable, the field study of soils."

Barnyard manure and products of decomposition, H. MURPHY (*Okla. Agr., 5 (1917), No. 9, pp. 13–16, 18*).—This is a brief summary of experience at several of the State experiment stations and at certain foreign experiment stations.

Manure from the sea, E. H. JENKINS and J. P. STREET (*Conn. State Sta. Bul. 194 (1917), pp. 3–13, figs. 7*).—This bulletin treats of the manurial value of

seaweeds and marine mud. Analyses of samples of these materials from the New England coast, made at the Rhode Island, Massachusetts, and Connecticut experiment stations, are given in the following table:

Average composition of seaweeds, calculated to 75 per cent moisture.

Kind of material.	Number of analyses.	Organic matter.	Nitrogen.	Phosphoric acid.	Potash.	Lime.	Magnesia.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Laminaria saccharina	8	(19.76)[1]	0.39	0.13	0.51	0.85	.[illegible]
L. digitata	7	.....	.45	.12	.62	.[illegible]	.[illegible]
Ascophyllum nodosum	11	(19.47)	.39	(0.02)	.79	.[illegible]	.[illegible]
Fucus vesiculosus	12	(19.34)	.43	.12	.50	.47	.[illegible]
Chondrus crispus	9	(18.75)	.70	.13	1.15	.....	.....
Zostera marina	13	(10.90)	.41	.15	.42	.91	.[illegible]
Rhodymenia palmata	1	.....	.68	.17	1.98	.87	.[illegible]
Phyllophora membranifolia	3	.....	.80	.11	.72	3.[illegible]	.[illegible]
Cladostephus verticillatus	1	.....	.39	.19	1.23	.71	.[illegible]
Polyides rotundus	1	.....	.82	.15	.36	.60	.[illegible]
Ahnfeldtia plicata	1	.....	.42	.09	.88	.22	.[illegible]
"Fine branching seaweed"	1	.....	.98	.21	1.74	.31	.[illegible]
Sea lettuce	1	.....	.33	.06	.48	.....	.....
Coarse sponge	1	.....	1.04	.25	.29	.14	.[illegible]

[1] Most figures in parentheses are results of single analysis and not average.

A comparison of average analyses of seaweed, New York horse manure, and cow manure with litter shows "that the average seaweed contains less organic matter, nitrogen, and phosphoric acid than New York horse manure, and compared with cow manure it has about the same amount of nitrogen, much less phosphoric acid, and more potash. Seaweeds are relatively deficient in phosphoric acid. . . . Eelgrass is generally regarded as inferior to the rockweeds as manure, though the composition of the fresh material is not strikingly different."

Analyses of 9 samples of marine mud from various places on the Connecticut shore showed an average moisture content of about 48 per cent, organic matter 3.95, and nitrogen 0.15 per cent. In four of these samples further determinations average, as follows: Potash, 0.35 per cent; soda, 0.72; lime, 0.45; magnesia, 0.52; phosphoric acid, trace; chlorin, 0.93; and sulphuric acid, 0.53 per cent. It is stated that although the percentages of organic matter, nitrogen, and potash in marine mud are small, "applications of from 1,000 to 2,000 lbs. per acre have given excellent results, due in part, no doubt, to the action of the mud as an amendment, making the soil more retentive of water, and perhaps in part also to the action of salt."

The value of coconut poonac as manure, M. K. BAMBER (*Dept. Agr. Ceylon, Leaflet 1 (1917), folio*).—Analyses of ordinary coconut poonac showed a content of nitrogen 3.33 per cent, phosphoric acid 1.47, potash 1.29, lime 0.9, and soda 1.17 per cent.

Experiments with humogen, M. H. F. SUTTON (*Reading, England: Sutton & Sons [1917], pp. 12, figs. 14*).—Experiments with mustard, Italian rye grass, and dwarf French beans to test the fertilizing value of humogen and also to compare it with barnyard manure and complete fertilizers are reported.

No great success attended the use of commercially manufactured humogen, although results were obtained with humogen made in the laboratory which were second only to those obtained with a complete fertilizer. "So far as the results of these tests show, it would appear that, however satisfactory humogen may be when prepared in the laboratory, some difficulty as yet exists in manu-

facturing this fertilizer efficiently on a commercial scale. The question also arises whether, when standardized, it can be placed on the market in a sufficiently concentrated form and at a price low enough to bring it within the reach of large users of fertilizers."

The industrial chemist and the fertilizer crisis, H. C. LINT (*Chem. Engin. and Mining, 25 (1917), No. 3, pp. 86–89*).—The author discusses the fertilizer problem from the standpoint of the industrial chemist, and discusses peat and muck as sources of organic ammoniates.

The effect of ammonium sulphate on soil acidity, F. E. ALLISON and R. C. WORK (*Soil Sci., 3 (1917), No. 6, pp. 507–512, fig. 1*).—Experiments conducted at Ames College are reported in which it was found that "the increases in acidity in five greenhouse soils and a quartz sand receiving no nitrogenous fertilizer were practically the same during the course of a year whether these pots were cropped or kept in fallow. The quartz sand showed the smallest increase in acidity and a loam soil the largest, but there was no relation between the acid accumulation and the soil texture. The increases in acidity in the presence of ammonium sulphate were markedly higher than in the check pots. The partial removal of the nitrogen added decreased the acidity to an appreciable extent in the quartz sand and in the heavy clay soil, increased it in the loam, and left it practically the same in the other three soils. The average increase in acidity in the soils used, exclusive of the quartz sand, was 4,140 lbs. of calcium oxid per 3,000,000 lbs. of soil where no crop was grown, and 3,240 lbs. where four crops of buckwheat were harvested. On the average, the increase in acidity produced by ammonium sulphate in greenhouse pots was about 80 lbs. of calcium oxid for 100 lbs. of ammonium sulphate applied."

The fixation of atmospheric nitrogen, D. FLORENTIN (*Génie Civil, 70 (1917), No. 20, pp. 319–322; 21, pp. 333–337; 22, pp. 353–355; 23, pp. 369–372; 24, pp. 385–388, figs. 14*).—This article reviews recent processes and discoveries relating to the industrial fixation of atmospheric nitrogen for agricultural and industrial use.

Some conditions affecting the value of calcium cyanamid as a manure, J. B. MOSSCROP (*Jour. Agr. Sci. [England], 8 (1917), No. 2, pp. 178–181*).—Bell-jar and pot experiments with lettuce, turnips, barley, and wheat to determine the cause of the injurious influence of calcium cyanamid led to the conclusion that "any injurious effect on germination when calcium cyanamid is used is due to the formation of free ammonia produced at first more rapidly than it can be absorbed by the soil." It was further found that the injurious action disappeared eight days after the manure had been applied to a moist soil. "Any danger to nonoily seeds or those with a thin testa can be avoided by applying the calcium cyanamid a week before sowing the seeds."

The value of Thomas slag phosphate for neutralizing soil as well as for supplying phosphorus, B. L. HARTWELL, F. R. PEMBER, and S. C. DAMON (*Rhode Island Sta. Bul. 171 (1917), pp. 3–34, pl. 1*).—Experiments are reported the main object of which was to help furnish a basis for the adoption of analytical methods suited to the inspection of the various grades of Thomas slag phosphate from the standpoint of their agricultural value.

In experiments with barley, beets, and lettuce to determine the value of Thomas slag phosphates from different sources for neutralizing acid soils, using chemically pure, precipitated calcium carbonate as a standard of comparison, it was found that the calcium carbonate did not give results markedly superior to those given by the slags with the first two crops. "With the lettuce, however, the conditions were such that, for about the same amount of calcium oxid

applied, that in the slags was only about a third as effectual as in the other form. . . .

"Data concerning the relative availability of the phosphorus in slags and other phosphates were secured by four pot experiments with dwarf Essex rape and one with Japanese millet. A field experiment with these two crops was also conducted for two years. The later experiments, both in the pots and field, were carried out according to directions furnished by the basic slag committee of the Association of Official Agricultural Chemists. The use in the pots of a preceding crop of crimson clover as a green manure did not increase the relative availability of the phosphorus in the insoluble phosphates, slag, and raw rock phosphate, or floats, in comparison with that in the soluble sources. In the pot experiments, although the slags compared very favorably with the soluble sources, the floats were decidedly inferior; even in large applications the latter material failed to supply the needs of the plants. From soil to which no phosphorus was added the millet absorbed per pot more than twice as much as the rape did. . . . Even when applied in the most available state more than four-fifths of the phosphorus became inaccessible to the first crop planted after its application.

"In the field experiments with both millet and rape results were obtained for the year in which the various sources of phosphorus were applied as well as the after-effects in the following year. The raw rock phosphate was much less available than the other sources of phosphorus. . . . Basic phosphate yielded somewhat less than the other slags, which compared favorably with the soluble phosphates.

"It would seem from the results of the experiments . . . that if water-soluble phosphate is considered entirely available, then a laboratory method for determining the availability of Thomas slag phosphate should include the use of some solvent which would dissolve nearly all of the phosphorus."

The rate of reversion of mixtures of superphosphate with basic slag and rock phosphates, G. S. ROBERTSON (*Jour. Soc. Chem. Indus., 36 (1917), No. 7, pp. 626–628*).—Experiments with mixtures of equal parts of 26 per cent water-soluble superphosphate and 26 per cent citric-soluble basic slag led to the conclusion that "on the whole it can not be said that a superphosphate and basic slag mixture has anything particular in its favor. If the basis of the mixture is one-half 26 per cent superphosphate and one-half basic slag, it is clear that if the slag contains 2 per cent of caustic lime practically all the water-soluble phosphate in the mixture will revert in a few hours."

Experiments with equal parts of 26 per cent superphosphate and Gafsa rock phosphate showed that "the water-soluble phosphate in the mixture reverts to a much less extent than in the slag and superphosphate mixture. The reversion is, comparatively speaking, so small that there would be no serious objection to farmers making and applying such a mixture. . . . There seems to be no serious difficulty in the way of manufacturers making such a mixture (1 of superphosphate to 1 of rock phosphate) and selling it with a guaranty of water-soluble phosphate, total phosphate, and, if advisable, citric-soluble phosphate."

Phosphate rock in 1916, R. W. STONE (*U. S. Geol. Survey, Min. Resources U. S., 1916, pt. 2, pp. 29–41*).—This report states that "the quantity of phosphate rock marketed in the United States in 1916 was 1,982,385 long tons, valued at $5,896,993, an increase of 146,718 tons in quantity and of $483,544 in value over the production of 1915. This increase was comparatively small but it indicates an improvement in the industry, and suggests that in spite of the curtailment in the exports the production of former years may in time be approached. . .

"The quantity mined in 1916 was 2,169,149 tons. Compared with the quantity mined in 1915, which was 1,935,341 tons, this was an increase of 12 per cent, as against a decrease of about 27 per cent in 1915 from 1914. In Florida the increase was about 17 per cent, 24 companies operating in 1916 instead of 17, as in 1915. In South Carolina there was a decrease of 46 per cent and in Tennessee an increase of 5 per cent. In Kentucky 1 producer reported rock mined. The production in the Western States decreased 55 per cent. . . .

"The western phosphate field includes about 2,500,000 acres, in which there are about 5,750,000,000 tons of high-grade rock within minable depth (5,000 ft.) of the surface, and in addition several billion tons of rock carrying from 15 to 30 per cent of tricalcium phosphate. Throughout most of the western field there is a main bed from 3 to 6 ft. thick which runs over 65 per cent in tricalcium phosphate. The workable deposits occur chiefly in public lands of the United States. The character and mode of occurrence of the rock are such that for the most part it must be mined by underground methods rather than by open cuts. The rock can be ground and treated with acid, however, without the preliminary washing and drying which increase the cost of production of eastern phosphates."

Data on foreign sources of phosphoric acid are also given.

Potash in agriculture.—III, Further researches, B. C. ASTON (*Jour. Agr. [New Zeal.], 14 (1917), No. 6, pp. 440–447*). In a further discussion of the potash situation in New Zealand (E. S. R., 37, p. 218), it is pointed out that flax waste, wood ashes from sawmills, hedge clippings, weeds, and liquid stock excreta are some of the more important sources of potash in New Zealand which are now disregarded or wasted. It is also thought that bracken as a source of potash is worthy of investigation, as studies have shown that New Zealand bracken in the young stages contains as much potash as Scottish bracken and gives a higher yield per acre.

The recovery of potash from beet sugarhouse waste liquors, H. E. ZITKOWSKI (*Sugar [Chicago], 19 (1917), No. 7, pp. 256–258; Metallurg. and Chem. Engn., 17 (1917), No. 1, pp. 17–19*).—It is pointed out in this article that technically the recovery of the potash from beet sugarhouse waste liquors is a comparatively simple and perfectly feasible problem. "It is simply one of evaporating the dilute liquors as economically as practical, charring the residue to produce the crude ash, and leaching and recrystallizing if this is desired. The quantities of water to be evaporated, however, are large, the necessary equipment costly, and commercially such a procedure has possibilities only during war prices."

Concentrated potash a by-product of cement mill (*Engin. News-Rec., 78 (1917), No. 13, pp. 630–632, figs. 3*).—Experience at a cement plant at Riverside, Cal., indicates that the possibilities of recovery of potash as a by-product in Portland cement manufacture are that 90 per cent of the potash contained in the raw mix can be volatilized, 10 per cent remaining in the clinker and 80 per cent being caught by the dust collector. Including filter losses, it is considered conservative to expect the recovery in the form of concentrated salt of 66⅔ per cent of the potash originally contained in the raw cement mix. A 100-ft. rotary kiln, it is stated, may produce from 4 to 7 tons of dust daily, the average potash content of which may range between 4 and 10 per cent.

With reference to the mechanical features of the process, the dust is drawn from bins under the electrical treatment into tanks, where it is put into solution by agitation in water of not less than 85° C., at a concentration of not over 5 per cent K_2O. The temperature soon rises to the boiling point, due to the hydration of the lime, and the potash goes rapidly into solution, the whole operation

of extracting the water-soluble potash from 7 tons of dust being accomplished in less than 50 minutes. Under filter-press treatment a cake is formed and removed, and the remaining solution evaporated and the salt collected for grinding and sacking. Six lbs. of potassium sulphate is now being recovered at the plant for every barrel of clinker burned, which at present prices is worth from 40 to 50 cts. per barrel of cement produced.

The possibilities of developing an American potash industry, H. K. Miller (*Metallurg. and Chem. Engin., 17 (1917), No. 2, pp. 78–87; abs. in Sci. Abs., Sec. B—Elect. Engin., 20 (1917), No. 10, p. 367*).—This is a rather comprehensive survey of the present potash situation in the United States and a discussion of future possibilities along this line.

The author believes "that the largest future source of cheap potash available in this country is in the iron industry and the cement industry. Germany is reported to have $150 invested in her potash mines and equipment for every ton of potash produced annually. On this basis $37,000,000 would be needed to produce the 250,000 tons of potash imported into this county. . . . The expenditure of this amount of money in this country in these two industries alone would result in the recovery of potash now lost amounting to nearly 200,000 tons. The balance could easily be obtained from the evaporation of lakes and brines, from beet-sugar waste, and from some of the processes now proposed for the manufacture of potash direct from feldspar or glauconite."

A key to the soil for better crops is soluble ground limestone (*Indianapolis, Ind.: Indiana Agr. Ground Limestone Assoc. [1917], pp. 15*).—This pamphlet briefly describes the use of ground limestone on soils.

Lime report, 1916, J. W. Kellogg et al. (*Penn. Dept. Agr. Bul. 294 (1917), pp. 53*).—This is the report of the official inspection and analysis of agricultural lime in Pennsylvania for 1916.

Fertilizer report, August 1 to December 31, 1916, J. W. Kellogg (*Penn. Dept. Agr. Bul. 288 (1917), pp. 71*).—This is a report of the official inspection and analysis of fertilizers in Pennsylvania for the period named.

AGRICULTURAL BOTANY.

The botany of crop plants, W. W. Robbins (*Philadelphia: P. Blakiston's Son & Co., 1917, pp. XIX+681, figs. 262*).—This book, intended for agricultural and nonagricultural students, is designed to give a knowledge of the common orchard, field, and garden crops, more than 100 being treated. After an introductory part in which the fundamentals of plant structure, function, activity, and classification are dealt with, the different crops are taken up in the order of their families, the habits of the plants, their distinctive characteristics, distribution, production, and uses being described. Keys are given of the principal economic types that will aid the student in recognizing and identifying forms with which he is unfamiliar.

Important range plants: Their life history and forage value, A. W. Sampson (*U. S. Dept. Agr. Bul. 545 (1917), pp. 63, pls. 56*).—The results are given of a study of the habits, requirements, and life history of more than 50 species of forage plants in the Wallowa National Forest in northeastern Oregon. Preliminary information regarding the palatability of the plants was obtained by observing sheep while feeding, and afterwards the relative value of the individual species was determined by studying their abundance, distribution, time of flower-stalk production, aggressiveness, reproduction (both vegetative and by seed), their palatability and nutritiousness at various times during the grazing season, and their ability to withstand trampling.

The data obtained relative to the life history of the different forage species appear to have made possible the adoption of what is known as the deferred rotation grazing system in this forest.

Tables are presented giving the soil moisture requirements, time of flowering, seed production, time of seed maturity, and seed viability of the different species investigated.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from January 1 to March 31, 1914 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 38 (1917), pp. 105, pls. 10*).—This inventory includes importations of about 700 lots of seeds and plants.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from April 1 to June 30, 1914 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 39 (1917), pp. 183, pls. 10*).—A list of seeds, together with economic notes, on about 1,000 importations of seeds and plants.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from July 1 to September 30, 1914 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 40 (1917), pp. 110, pls. 10*).—This gives accounts of about 640 introductions, most of the material having been received from China, India, and Brazil.

New or noteworthy plants from Colombia and Central America, VI, H. PITTIER (*U. S. Nat. Mus., Contrib. Nat. Herbarium, 18 (1917), pt. 6, pp. 225–270+X, pl. 1, figs. 7*).—This paper is a continuation of a series of studies by the author on the flora of Colombia and Central America (E. S. R., 34, p. 827).

The Middle American species of Lonchocarpus, H. PITTIER (*U. S. Nat. Mus., Contrib. Nat. Herbarium, 20 (1917), pt. 2, pp. 87–93+X, pls. 6, figs. 43*).—A description is given of the species of Lonchocarpus known to occur in Central America and Mexico.

The families and genera of the bacteria, C. E. A. WINSLOW, JEAN BROADHURST, R. E. BUCHANAN, C. KRUMWIEDE, JR., L. A. ROGERS, and G. H. SMITH (*Jour. Bact., 2 (1917), No. 5, pp. 505–566*).—A preliminary report is given of the committee of the Society of American Bacteriologists appointed to consider the characterization and classification of bacterial types. An outline of the families and genera of bacteria is presented. The committee proposes the recognition of four orders of Schizomycetes, the Eubacteriales embracing 8 families and 31 genera. The adoption is recommended of the principles of the so-called Vienna Code of Botanical Nomenclature, with the exception of the requirement of Latin descriptions. It is also recommended that the date of publication of the third edition of Zopf's Spaltpilze be taken as the date for the beginning of bacteriological nomenclature in determining priority, except for a list of genera considered to be adopted by the society at its 1918 meeting.

Is symbiosis possible between legume bacteria and nonlegume plants? T. J. BURRILL and R. HANSEN (*Illinois Sta. Bul. 202 (1917), pp. 113–181, pls. 10, figs. 8; abs., pp. 4, fig. 1*).—This bulletin gives an account of investigations of legume bacteria and an attempt to develop symbiosis between legume bacteria and nonlegume plants similar to that which exists between *Pseudomonas radicicola* and leguminous plants.

Studies preliminary to the attempt to develop strains of bacteria that would exist in symbiosis with nonlegume plants showed that the nodule bacteria taken from the roots of leguminous plants may be divided into 11 groups according to the host plants to which they have become specifically adapted. By means of cultures, the authors have been able to isolate *P. radicicola* from all of the 11 families of Leguminosæ, and while the various nodule bacteria exhibit sero-

logical and cultural differences which are permanent, yet in other characteristics they are so alike that it is considered best to regard the adapted forms as varieties of a single species. The nodules occurring on Ceanothus, Cycas, Alnus and Myrica are said not to be caused by *P. radicicola*, those on Ceanothus differing morphologically from those found on the Leguminosæ. The authors do not consider conclusive the evidence that the nodules on Elæagnus and Podocarpus are caused by legume bacteria, nor is the proof conclusive that any of these nonlegume plants are concerned in the fixation of atmospheric nitrogen.

Extensive experiments were conducted in an attempt to infect nonlegume plants with nodule bacteria, always with negative results, and it is claimed that no conclusion can be drawn as to the possibility or probability of developing or finding nodule bacteria that will grow on nonlegume plants.

An extensive bibliography of the subject is appended.

The abstract is by A. L. Whiting.

The behavior of self-sterile plants, E. M. EAST (*Abs. in Science, n. ser., 46 (1917), No. 1183, pp. 221, 222*).—According to the author, there are two problems connected with the inheritance of self-sterility in plants. One is the relation between self-sterile and self-fertile plants, the other the behavior of self-sterile plants when crossed together. In Nicotiana self-fertility is completely dominant over self-sterility. Either of the self-sterile species *N. alata* or *N. forgetiana* may be crossed with the self-fertile species *N. langsdorffii*, resulting in each case in an F_1 generation which is completely self-fertile. The F_2 plants are said to show the usual monohybrid ratio of 3 self-fertile to 1 self-sterile.

Discussing the results obtained in his investigations, the author concludes that the behavior of self-sterile plants in intercrosses is regulated by several transmissible factors, all of which are distinct from the single basic factor for self-sterility and which presumably may be carried by self-sterile plants. A plant homozygous for self-sterility can neither be fertilized by its own gametes nor by the gametes of any other self-sterile plant of like constitution as regards these regulation factors, but any two plants differing in these regulation factors are cross-fertile.

Twin hybrids from Œnothera lamarckiana and Œ. franciscana when crossed with Œ. pycnocarpa, G. F. ATKINSON (*Abs. in Science, n. ser., 46 (1917), No. 1183, p. 222*).—According to the author, when *Œ. lamarckiana* is crossed with *Œ. pycnocarpa*, there is a splitting in the F_1 generation with the production of twin hybrids. One of the twins is characterized by the *pycnocarpa* type while the other is designated as a *lamarckiana* type. These twin types are fixed in the first generation, and are repeated in the F_2 and probably in the following generations in accordance with the usual behavior of twin hybrids determined by De Vries.

When *Œ. franciscana* and *Œ. pycnocarpa* are crossed, there is said to be a splitting in the F_1 with the production of twin hybrids, and in the F_2 generation there is a one-sided splitting similar to that which occurs in the F_1 of twins from *Œ. hookeri* and *Œ. lamarckiana*, as described by De Vries. In the second grouping the *pycnocarpa* type twin is said to have a hybrid constitution while the *franciscana* type of this generation is fixed in the F_1 and repeats itself in the F_2. The *franciscana* twin is believed to carry the *pycnocarpa* factor but in a subordinate or permanently latent condition.

Naming American hybrid oaks, W. TRELEASE (*Abs. in Science, n. ser., 46 (1917), No. 1184, p. 244*).—In a study of American oaks, the author has investigated 38 known or probable hybrids among the oaks of the United States. Of the number of accepted hybrids already recorded two are added in this pa-

... cases of hybridity have been observed in which a species of the white ... has intercrossed with a species of the red oak group.

The anatomy of woody plants. E. C. JEFFREY (*Chicago: The University of ... Press, 1917. pp. X+478. pl. 1. figs. 307*).—In this book the author treats ... anatomy of vascular plants, with special reference to its historical ... experimental aspects. In former standard works upon this subject the ... of existing forms is treated, but the author of the present work sup- ... paleobotanical and developmental data that are fundamentally im- ... for an understanding of the evolution of plant organization. A chapter ... technique is given that may be used as a guide to the prepara- ... material for study.

... y and physiology of the red mangrove, H. H. BOWMAN (*Abs. in ... sci., n. ser., 46 (1917), No. 1184, p. 245*).—A report is given of an examina- ... microscopic structure of the various tissues of the red mangrove, ... rial having been collected in the Gulf of Mexico along the lower ... Keys. Particular attention has been paid to the presence of intercel- ... cells and to the occurrence of tannin cells. The physiological rela- ... transpiration and absorption of these plants growing in sea water and ... ons of it, as well as in fresh water, have been studied.

... author has deduced the law that the transpiration of these plants varies ... as the concentration of the medium. It was also found that there is a ... relation between the amounts of sugar and tannin in the hypocotyls at ... ent stages of growth of the plants.

The chemical basis of regeneration and geotropism. J. LOEB (*Science, n. ... (1917), No. 1179, pp. 115–118*).—In continuation of the author's investi- ... Bryophyllum (E. S. R., 37, pp. 324, 325), additional information is ... which it is shown that the rate of geotropic bending of horizontally ... shoots of *B. calycinum*, if an apical leaf is attached to the stem, increases ... mass of the leaf. The author believes that the phenomena of geotrop- ... due to the chemical mass action, probably of the common nutritive ... circulating in the sap, and they are apparently of the same nature as ... wth of dormant buds, which is also due to a mass action of the same ...

The effects of acids and salts on biocolloids. D. T. MACDOUGAL and H. A. ... (*Science, n. ser., 46 (1917), No. 1185, pp. 269–272*).—In continuation of ... ations on what the authors term biocolloids (E. S. R., 37, p. 325), a ... given of the effects of various acids, alkalies, salts, and their various ... tions in stimulating growth.

... thesia and respiration. A. R. C. HAAS (*Science, n. ser., 46 (1917), No. ... 593–594*).—A preliminary account is given of investigations on the ... of anesthetics upon respiration, from which the author concludes that ... Laminaria is exposed to the action of anesthetics in sufficient concentra- ... produce any result there is an increase in respiration. This may be ... by a decrease if the reagent is sufficiently toxic, but no decrease was ... with low concentrations which were not toxic.

The measurement of light in some of its more important physiological as- ... D. T. MACDOUGAL and H. A. SPOEHR (*Science, n. ser., 45 (1917), No. ... 615–618*).—The results are given of a test of the photoelectric cell de- ... Elster and Geitel, comparisons being made with the Smithsonian ... meter.

... authors state that the sodium cell connected with a suitable portable ... "... offers many advantages for the measurement of light intensities

in natural habitats and that the action of the photoelectric cell in light ... more nearly parallel to that of the organism than that of any other ... measuring instruments hitherto available.

FIELD CROPS.

Effect of fall irrigation on crop yields at Belle Fourche, S. Dak. F. D. FARRELL and B. ACNE (*U. S. Dept. Agr. Bul. 546 (1917), pp. 13, fig. 1*). The favorable results secured at Scottsbluff, Nebr. (E. S. R., 32, p. 36), with ... irrigation for spring-planted crops led to a repetition of the experiments ... different soil conditions at the Belle Fourche Experiment Farm. The experiments were begun in 1913, and involved the use of oats, sugar beets, potatoes, barley, corn, and wheat grown on duplicate check plats receiving ... usual summer irrigation and on duplicate plats receiving in addition a fall irrigation. The results secured in 1914, 1915, and 1916 are reported and discussed.

The soil upon which these experiments were conducted is described as ... extremely heavy clay, popularly known as "gumbo" and classified by the Bureau of Soils as Pierre clay. Mathews (E. S. R., 36, p. 210) reports that this soil would carry approximately 30 per cent moisture, about half of which would be available to crops, and that the wilting coefficient of the soil approximates 17 per cent. During the nine years 1908–1916, inclusive, the annual rainfall varied from 6.64 in. in 1911 to 21.02 in. in 1915, the mean being 14.07 in. The mean precipitation for the fall period (August to October, inclusive) for the 9-year period was 3.75 in. and for the winter period (November to March, inclusive) 2.15 in.

The average crop yields secured on the fall-irrigated plats and on the check plats are reported in tabular form and the summarized statement below given to show the probable errors of the average yields.

Summary of crop yields showing the probable errors of the averages.

Crop.	Unit of yield.	Fall-irrigated plats.		Check plats.		Increase in favor of fall irrigation.
		Number of plats averaged.	Average yield per acre.	Number of plats averaged.	Average yield per acre.	
Wheat	Bushels	6	22.1± 2.2	6	20.1± 1.4	+2.0±
Oats	do	6	61.9± 5.0	6	67.8± 6.0	−5.9±
Barley	do	6	33.9± 1.5	6	36.1± 2.3	−2.2±
Flax	do	6	13.7± 1.4	6	15.2± 0.9	−1.5±
Corn	do	6	42.2± 3.3	6	43.9± 3.1	−1.7±
Beets	Tons	6	8.4± 1.1	6	9.2± 1.1	−.8±
Potatoes	Bushels	6	167.0±23.0	6	172.0±19.0	−5.0±

Since none of the differences in favor of fall irrigation was as great as ... probable error, all were regarded as insignificant. The lower average yields ... the fall-irrigated plats are attributed to the relatively low productivity ... one of the two fall-irrigated series, the 3-year average yield of which was ... per cent lower than that of the duplicate series, while the corresponding ... ages of the two check series were identical. This low production was ... to have been associated with a heavy infestation of gumbo weed, *Iva axillaris* ... on the low-yielding series.

Soil moisture determinations made in the spring and early summer of ... year are reported and the data tabulated for each year of the experiment. ... 1914 the first two samplings showed more moisture in the first 3 ft. of

irrigated plats than in the corresponding depth of the check plats. No effect was noted beyond the third foot, the differences in the upper 3 ft. occurring at a time when all plats contained abundant moisture and disappearing before the end of June. No significant differences were found in 1915 or 1916. The failure of fall irrigation to increase crop yields in these experiments appears to be attributable to the character of the soil. Being a heavy clay, absorption occurred only when the soil was dry, and was followed rapidly by expansion, which so compacted the soil that it became impervious and hindered the storage of water in the lower depths for the use of the crops.

Progress report, Substation No. 2, Troup, Tex., 1901–1914, W. S. HOTCHKISS (*Texas Sta. Bul. 209 (1917), pp. 1–13, fig. 1*).—Variety tests with cotton and corn for 1912–1914, inclusive, and fertilizer tests with sweet potatoes for 1907, 1908, and 1911 are noted, supplementing a previous report (E. S. R., 29, p. 736).

The average yields of the ten highest-yielding cotton varieties tested two or more times varied from 690 lbs. of seed cotton per acre for Half and Half to 732 lbs. for Texas Oak. Mebane, second with an average yield of 732 lbs. of seed cotton, is deemed superior to the other varieties tested because of its high yield of lint, averaging 38 per cent, and because of other desirable qualities.

In the corn variety tests Munson with 22.9 bu., Red Indian Chief with 22.1 bu., Strawberry with 20.5 bu., Oklahoma White Wonder with 20.4 bu., and Improved Giant White with 19.1 bu. gave the highest average yields for two years.

In fertilizer tests with sweet potatoes the best results were obtained with acid phosphate and cottonseed meal, both when used singly and in combination, a mixture of the two being deemed advisable. An average increase of 30.3 bu. per acre for the three years of the test was attributed to acid phosphate and an increase of 33.3 bu. per acre to cottonseed meal. Potash is regarded as unnecessary on the soils on which these tests were conducted, while nitrate of soda, although giving good results, must compete with cottonseed meal as a source of nitrogen.

Report of the Bermuda Board of Agriculture, 1914–15, E. J. WORTLEY (*Bermuda Bd. Agr. Bermuda, 1914–15, pp. 21–26, 27–32*).—A general administrative report including a brief discussion of seed-potato improvement.

Field crops work in Argentina], J. M. HUERGO (*Min. Agr. Argentina, Mem. Sec. Nac., 1914–15, pp. 42–45, 46, 50–53, 55, 56*).—Brief reports are given of work in improvement through selection, the importation and production of potatoes, alfalfa seed importations, the cotton industry, the production of rice, seed analyses, the classification of commercial seeds, the production of barley for brewing purposes, and tobacco production, for the year 1914–15.

Field crops], P. SYMEONIDES (*Cyprus Agr. Jour., No. 44 (1917), pp. 974–978, fig. 1*).—Fertilizer, variety, and cultural tests with wheat, barley, oats, rye, and canary seed are reported for the season of 1916. Further notes are given on "Starokrithi" (E. S. R., 34, p. 339), the so-called wheat-barley hybrid.

Report of field crops work at the Bankipoor Agricultural Station, 1915–16, G. SHERRARD (*Rpt. Dept. Agr. Bihar and Orissa, 1915–16, pp. 43–49*).—Fertilizer and cultural experiments with rice are reported for the year. An application of 4 tons of manure showed a net profit of $6.18 per acre as compared with $4.43 from an application of one-half that amount. Acid phosphate applied at the rate of 120 lbs. per acre showed a net profit of $10.06, but was supplemented by 160 lbs. of ammonium sulphate of $7.48.

Experiments are reported with gram (*Cicer arietinum*) sown broad... the standing rice and left to grow through the cold weather after the ... removed.

Rate-of-seeding tests with rice indicated that seedings of 410 lbs. per ... of seed bed gave considerably higher yields than seedings of 615 lbs. ... planting 8 seedlings per hole showed higher yields than 1, 2, or 4 ... per hole.

Variety and cultural tests with sugar cane are briefly noted. The ... cane cultivated by the local method as compared with trenching was ... erably higher for the former.

[**Report of work with field crops at the Benares Agricultural** St... L. C. SHARMA (*Rpt. Benares Agr. Sta., United Provs. Agra and Oudh, 1913-14*).—Reports are given on variety tests with sugar cane, corn, cotton, ... rice, barley, and gram, together with tests of sunn hemp and millet ... study of the effect of hot-weather cultivation on wheat yields.

The sugar-cane experiments included a comparison of thick and thin var... rate-of-seeding tests, fertilizer tests, and irrigation tests. Saretha, the ... yielding thin variety, gave 6,888 lbs. of gur (crude sugar) per acre, ... Red Mauritius, the highest yielding thick cane, gave 8,448 lbs. per acre. ... most satisfactory seeding rate was 20,000 cuttings per acre, with a yield ... 52,808 lbs. of cane. Of various irrigations the highest yield of cane, ... lbs. per acre, followed eight irrigations. The highest percentage of gur ... juice in the fertilizer tests was 19.1, obtained on the plat receiving 480 ... ammonium sulphate per acre, while the highest yield of cane was obtained ... the use of 180 lbs. of ammonium sulphate and 350 lbs. of acid phosphate, ... gave only 17.3 per cent of gur.

Irrigation experiments with wheat resulted in a yield of 2,044 lbs. of ... and 3,608 lbs. of straw per acre from three irrigations, as compared with ... lbs. of grain and 1,640 lbs. of straw from one irrigation. Considerable ... was also realized from flushing the field before seeding. Hot-weather ... tion to preserve soil moisture was found to give increased yields of wheat ... the ordinary methods, both with and without supplementary irrigations.

[**Report of field crops work at the Cuttack Agricultural Station, 1915-**... D. R. SETHI (*Rpt. Dept. Agr. Bihar and Orissa, 1915-16, pp. 56-63*). ... and variety tests with rice and cultural and seed selection tests are ... reported as heretofore (E. S. R., 35, p. 31).

The results of fertilizer tests indicated that green manuring is the ... and most efficient system of fertilization, but owing to the fact that ... rice of this section is broadcasted the introduction of green manures is ... About 10 lbs. of daincha (*Sesbania aculeata*) were planted with the ... the daincha plants plowed under through the unique system of ... prevalent in this region. By this system the broadcasted fields are ... and cross-plowed during July to thin the crop and as a means of ... This plowing is immediately followed by a weeding which serves to ... the uprooted daincha plants. The results of the first year of this ex... showed an increased yield of 146 lbs. of grain and 386 lbs. of straw ... over the untreated field.

The transplanting of 2 or 3 seedlings 9 or 10 in. apart gave higher yields ... the common practice of transplanting 10 or 12 seedlings 5 or 6 in. apart.

A comparison of transplanting rice with broadcasting showed an ... yield of 243 lbs. of grain and 420 lbs. of straw per acre for the former. ... Cultivation of the paddy fields during the hot weather (April) ... increased yield of 246 lbs. of grain and 169 lbs. of straw over monsoon ... cultivation.

Variety tests with jute, peanuts, and peas are briefly reported.

Report of field crops work at the Dumraon Agricultural Station, 1915–16. G. SHERRARD (*Rpt. Dept. Agr. Bihar and Orissa, 1915–16, pp. 52, 53*).—Continuation of fertilizer and variety tests with rice as previously noted (E. S. R., 35, p. 32) is reported. An application of about 2 tons of manure per acre followed by a net return of $15.34 as compared with $12.45 from an application of about 4 tons.

Report of work with field crops at the Orai Experiment Station. B. C. [illegible] (*Rpt. Agr. Sta. Orai, Jalaun [India], 1916, pp. 4–16*).—Variety tests are reported with wheat, gram, millet, cotton, and pigeon peas. The Soharia variety of wheat is recommended for unirrigated regions, while Pusa 4 is recommended for all irrigated soils.

An average of 55.5 lbs. of wheat and 18.5 lbs. of gram per 0.1-acre plat was secured from a mixed seeding. Wheat in rotation after gram, however, yielded 75 lbs. per 0.1-acre plat, and gram after wheat 96 lbs.

An application of potassium nitrate equivalent to 25 lbs. of nitrogen per acre was followed by an increased wheat yield of only 10 lbs. of grain per plat and a decrease of 350 lbs. of straw, as compared with the untreated plat. The gram crop following gave an increased yield of 115 lbs. per acre on the fertilized plat.

Report of work with field crops at the Partabgarh Agricultural Station. [illegible] SHARMA (*Rpt. Partabgarh Agr. Sta. United Prov. Agra and Oudh, 1916, pp. 1–6*).—Varietal, cultural, and fertilizer tests with rice, and varietal and [illegible] tests with sugar cane, peanuts, wheat, barley, gram, peas, and potatoes are noted.

An increased wheat yield of 633 lbs. of grain and 927 lbs. of straw per acre is recorded from plats cultivated in the ordinary way with three irrigations, as compared with the yields from hot-weather cultivation.

Report of field crops work at the Ranchee Experiment Farm, 1915–16. [illegible] (*Rpt. Dept. Agr. Bihar and Orissa, 1915–16 pp. 68–73*).—This is the first annual report of experimental work at the Ranchee station and briefly outlines the projects being studied. Extensive fertilizer experiments with rice are in progress. The highest yield for the past year, 3,680 lbs. per acre, was obtained from an application of 160 lbs. of gypsum.

Report of field crops work at Sabour Farm and Agricultural College, 1915–16. S. N. SIL (*Rpt. Dept. Agr. Bihar and Orissa, 1915–16, pp. 18–25*).—This reports the continuation of experiments previously noted (E. S. R., 35, p. 31).

Cultivation of the fallow during hot weather and the application of approximately four tons of manure per acre showed increased yields of grain over other treatments.

Experiments with rice gave practically the same results as those of the previous year, with the following exceptions: The vitality of the seedlings appeared to be unaffected by thick planting in the seed bed; the wet seed-bed seedlings were inferior, due to the water-logged condition of the plats; on the manured plat the total yield was relatively small, due to lodging; and the difference between the "single" and "bunch" transplanting of seedlings in rows 6 in. apart was very slight. Early transplanting (July 10) gave the best results. The green manuring of paddy lands has given good returns, which have been augmented by applications of lime and bone meal. Transplanted rice gave much higher yields of both grain and straw than sowing broadcast or dibbling.

Seedings of rahar (*Cajanus indicus*) in July gave higher yields than seedings in either May or June. Variety tests with rahar, wheat, and rice are reported.

[Report of field crops work at Sepaya Experiment Farm, 1915–16], M. M. MACKENZIE (*Rpt. Dept. Agr. Bihar and Orissa, 1915–16, pp. 76–79*).—Experimental work with sugar cane, forage crops, and fertilizers is briefly outlined. Results of analyses of sugar-cane varieties grown at Sepaya are reported in tabular form.

Fodder crops of Western India, H. H. MANN (*Dept. Agr. Bombay Bul.* [illegible] (*1916*), *pp. 142*).—This is a compilation of available information relative to the cultivated fodder crops of Western India, showing the adaptation of each, method of cultivation, yield, and value of the fodder produced. The area under cultivated fodder crops in the Bombay Presidency is estimated to be about 124,920 acres.

Some wild fodder plants of the Bombay Presidency, W. BURNS, R. E. BHIDE, L. B. KULKARNI, and N. M. HANMANTE (*Dept. Agr. Bombay Bul.* [illegible] (*1916*), *pp. 24, pls. 34*).—This bulletin is a compilation of available information relative to some of the wild grasses and leguminous plants used as forage in the Bombay Presidency, giving their vernacular names, habitat, life history, chemical composition, and feeding value. Thirty-four such plants are described and illustrated.

How to change the rotation system, G. SORGIA (*Agr. Terra Lavoro, 6 (1917), No. 1, pp. 2–8*).—The author describes in detail and illustrates with diagrams changing from a biennial rotation to a quadrennial rotation, based on *Trifolium pratense*, or to a septennial or octennial rotation, based on *Medicago sativa*. A method is also described for changing from a quadrennial system to an octennial one.

Experiments in meadow culture on peat bogs, V. A. FOMINYKH (*Selsk. Khoz. i Lĕsov., 251 (1916), June, pp. 145–160*).—This reports experiments in 1914 and 1915 in an effort to convert peat bogs into meadows. The different treatments resulted in the increased yields noted below: Harrowing alone 56.8 per cent; harrowing combined with fertilizing, 300 per cent; seeding to grass after harrowing and fertilizing, 350 per cent—also procuring a change in the flora of the bog; plowing, fertilizing, and seeding to grass, 600 to 900 per cent.

Permanent pasture formation, A. W. GREEN (*Jour. Agr. [New Zeal.], 15 (1917), No. 1, pp. 28–31*).—This reports pasture-formation experiments in progress at Ruakura, New Zealand, to determine (1) the influence of temporary fillers on the permanent grasses and clovers which will ultimately constitute the permanent pasture, (2) the value of temporary fillers in reducing the weed content in permanent pastures, and (3) the comparative value of different fillers for early feed. The fillers included in the experiment were prairie grass, cape barley, Italian rye-grass, broad-leaved Essex rape, and thousand-headed kale.

The results to date indicate that rape is the most valuable plant of those tested, due to its habit of growth and resistance to cold. Sheep turned into pasture on the unfenced plats at first preferred the rye-grass, but soon left it for barley and rape. The kale plat was left until last. The highest total live weight gain, 379 lbs., was obtained from a seeding of 2 lbs. of rape per acre at the minimum cost for all fillers of 40 cts. The least gain in live weight, 175 lbs., was realized from a seeding of 25 lbs. of barley per acre, at a cost of 78 cts.

Grasses for pasture and hay in Texas, G. M. GARREN (*Texas Agr. Col. Ext. Serv. Bul. B-32 (1916), pp. 16, figs. 4*).—A popular discussion of suitable hay and pasture grasses for Texas, with general recommendations for the establishment of meadows and pastures.

The selection of cereals in Italy, G. PATANÈ (*Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 6, pp. 777-787; abs. in Jour. Roy. Hort. Soc., 43 (1917), No. 3, p. 105*).—Systematic plant breeding, principally with cereals, is being conducted at 10 centers in Italy, and the work, modeled after that of the Svalöf station, is reviewed in this article. Selection and hybridization form the principal features of the investigations, and include studies with wheat, rice, barley, oats, corn, rye, pulses, potatoes, pumpkins, tomatoes, alfalfa, and other crops.

A study of cleistogamy and parthenogenesis from the standpoint of genetics, especially with the Cruciferæ and Leguminosæ, is being made by P. Brizi at the Royal Agricultural College, at Milan. Cereals and Leguminosæ are also being bred on Mendelian lines.

The influence of chemical fertilizers upon the composition of the cereals (*Agr. Mod. [Milan], 22 (1916), No. 24, pp. 284, 285*).—This reports analyses of grain grown on different soil types in France and under varying fertilizer treatments to determine the effect of the fertilizer upon the composition of the grain. The fertilizers used were acid phosphate, sodium nitrate, muriate of potash, and manure.

In every case the weight of the grain was materially higher with the fertilizer treatment. A complete chemical fertilizer in each case resulted in a higher percentage of protein in the grain than on the untreated plat or the plats receiving only partial fertilization. Manure alone showed a slight increase in the protein content, except with corn, which showed a slight reduction. With manure supplemented by chemical fertilizers slightly increased percentages of protein were obtained. The percentage of phosphoric acid in the grain was increased under all fertilizer and manurial treatments. See also a previous note by Prokhorov (E. S. R., 34, p. 230).

Statistics on the production of cereals and legumes, 1916 (*Estadística de la Producción de Cereales y Leguminosas en el año 1916. Madrid: Govt., 1916, pp. 32*).—Statistics are given on the acreage and production of wheat, barley, rye, oats, corn, chick-peas, vetch, field peas, beans, and other less important cereals and legumes in Spain for 1916. Brief observations are reported on the influence of meteorological conditions upon the cultivation and harvesting of cereals and legumes in each of 13 regions.

Growth of the root system of Medicago sativa, SHISTOVSKIJ (*Iuzh. Russ. Selsk. Khoz. Gaz., 17 (1915), No. 30, pp. 6, 7; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 8, pp. 1088, 1089*).—Observations are reported on the development of the root system of *M. sativa* at different stages of growth.

The alfalfa was sown in Rotmistrov boxes in the open field and the roots examined by washing with water at the ages of 1, 2, 2.5, 3, 3.5, and 4 months. The results of these observations are reported in tabular form. The data include the length in centimeters of the aerial portion and roots and the horizontal extension of the roots, together with the root coefficient, which is the product of the length and the horizontal extension of the root.

The results indicate that the growth of the root system continues uninterruptedly from germination to fructification, but that growth is not uniform. At the age of 2.5 months the roots had attained a length of from 45 to 51 centi-

meters (17.7 to 20.1 in.), and in the following 2 weeks, which [illegible] flowering period and actual growing period itself, the root growth [illegible] intense, attaining a length at the age of 3 months of from 103 to 110 [illegible] Such great fluctuations in root growth were not observed previous to [illegible] ing this period, and the author believes this fact to be the essential [illegible] investigations.

These observations are said to confirm those of Rotmistrov, but to [illegible] the process of root growth by establishing the period of most inte[illegible] ment.

The effect of phosphorus on alfalfa and alfalfa bacteria. H. W. [illegible] (*Soil Sci., 3 (1917), No. 1, pp. 77–98, pls. 2*). Investigations are repo[illegible] effort to discover the reason for the beneficial influence of phosph[illegible] alfalfa and other legumes, as simple nutrition (shown by chemic[illegible] is deemed insufficient to account for this phenomenon. The hypo[illegible] vanced that phosphorus fertilization may cause greater growth [illegible] of the root bacteria, resulting in greater nitrogen fixation and [illegible] growth of the leguminous host. This theory has been tested [illegible] In these investigations. The experiments fall into two parts, (1) those treat of the influence of phosphorus upon the growth of the alfalfa or[illegible] (*Bacillus radicicola*) as shown by numerical counts, and (2) those which of the influence of phosphorus upon alfalfa as regards nodule form[illegible] of growth, dry weight of plants, and percentage and absolute conte[illegible] gen. The secondary phosphates of potassium, sodium, and calcium were in quantities sufficient to supply a phosphorus equivalent of 0.1, 0.02, and per cent. The studies were made at the University of Wisconsin.

The treatment of pure cultures of *B. radicicola* from alfalfa with [illegible] resulted in large increases in the number of organisms, varying with the [illegible] tion and solubility of the salt. The highest counts were obtained from [illegible] ments supplying a phosphorus equivalent of 0.02 per cent, and disodium [illegible] phate gave the highest increase after seven days' incubation, with dicalcium phosphate next.

Pot culture experiments were conducted under greenhouse conditions [illegible] effect of dicalcium phosphate upon alfalfa. Alfalfa grown on [illegible] soil was inoculated, treated with phosphates and phosphorus plus nitro[illegible] the results in nodule formation, dry weight, and percentage and absolute gen content compared with all possible control combinations. Percentages phosphorus of 0.005, 0.015, and 0.045, equivalent to field applications [illegible] 2,100, and 6,300 lbs. per acre of rock phosphate, respectively, were [illegible] and urea equivalent to 0.014 per cent used as a nitrogenous fertilizer.

The results of phosphorus fertilization of alfalfa may be briefly [illegible] as follows: The seedlings made a much more rapid growth, and [illegible] nodule formation, dry weight, and total nitrogen content was observed third cutting (much more representative of normal average conditions) [illegible] not only an increase in total nitrogen, but also an increase in the [illegible] of nitrogen associated with the addition of phosphorus fertilizer.

The author concludes that the early increase noted in the growth of [illegible] phorus-treated seedlings may be a result of nutrition of the plant [illegible] stimulation frequently associated with cell reproduction and to the [illegible] of bacterial processes in the soil. The ultimate increases in growth [illegible] from phosphorus treatments may be due to increased infection with [illegible] organisms, increased growth and proliferation of the organism within nodule, and consequently increased nitrogen fixation.

A bibliography of 26 articles comprising the literature cited is given at the end of the paper.

A semiannual cropping system for bean lands, G. W. HENDRY (*Univ. Cal. Agr. Exp. Sta. Bul.* 4 (1917), *No.* 6, *pp.* 181, 182, *fig.* 1).—Recommendations are made concerning the utilization of bean land during the winter months for the production of certain hardy leguminous crops in California. Increases in the harvest prices for 1916 over those received before the war, amounting to from 25 per cent for horse beans to 150 per cent for Large White (Lady Washington) beans, has resulted in increased rentals and share leasings, necessitating more intensive cultural conditions.

A semiannual cropping system such as proposed presupposes a well-drained soil not subject to winter inundations but readily irrigable in October and May, and such as facilities for rapid handling of the crops in the field. The winter crop should be planted during October and harvested not later than May 15. The following crops are suggested and their market value briefly discussed: Horse beans, garbanzos, garden peas, field peas, and lentils.

Investigations on the mode of determining the germinating capacity in beet seed, E. VITEK (*Ztschr. Zuckerindus. Böhmen.*, 40 (1916), *No.* 8, *pp.* 563-578; abs. in *Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), *No.* 8, *p.* 1109).—Experiments are reported to determine whether blotting paper or sand give more accurate results in germination tests. In 1913, 400 samples of seed were compared, 77 per cent showing a higher germination on blotting paper than on sand, and 88 per cent giving a larger number of embryos on blotting paper than on sand. Analogous results were obtained in 1914.

Influence of very low temperatures on the germination capacity of beet seeds, J. URBAN and E. VITEK (*Ztschr. Zuckerindus. Böhmen.*, 40 (1916), *No.* 7, pp. 299-309; abs. in *Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr.*, 7 (1916), *No.* 8, *pp.* 1105, 1106).—The authors report experiments with sugar beet seed to determine the influence of low temperature on germination. Samples of beet seed were exposed for 30 minutes at a temperature of −180° C., produced by the spontaneous evaporation of liquid air, and germinated with unexposed seed at a temperature varying from 20 to 30°. After 15 days 95 per cent of the unfrozen seed and 96 per cent of the frozen seed had germinated, indicating that the heaviest frosts do not impair the germinability of beet seeds having a normal water content.

To test the behavior of seed harvested in wet weather samples of seed containing approximately 20 per cent water were exposed to the same temperatures for periods from 2 to 72 hours. The results indicated that the germinative capacity of the seed had been impaired by freezing, but that exposure for 72 hours had no more effect than exposure for a shorter length of time.

Boiling buffalo clover seed, A. D. MCNAIR (*Science, n. ser., 45 (1917), No.* 1165, *pp.* 220, 221).—The author reports tests with the seed of buffalo clover (*Trifolium reflexum*) in attempts to increase their germinability. The process of boiling the seed one minute as practised in the case of spotted bur clover (*Medicago arabica*) increased germination from 4 to 30 per cent. Experiments with bur clover conducted by the Alabama Experiment Station (E. S. R., 32, p. 520), in which the seed were soaked before boiling, led to similar tests with buffalo clover, with the following results as to percentages of germination: No treatment, 0; boiled 5 seconds, 53; boiled 30 seconds, 60; boiled 60 seconds, 70; soaked in cold water 12 hours, 0; soaked in cold water 12 hours and boiled 5 seconds, 47; soaked in cold water 12 hours and boiled 30 seconds, 87; and soaked in cold water 12 hours and boiled 60 seconds, 93.

An interesting seed corn experiment, H. D. HUGHES (*Iowa Agr.*, *17* (1917), *No. 9, pp. 424, 425, 448, fig. 1*).—This is a preliminary report on a test of prize-winning seed corn to determine whether such corn gives the highest production when planted in the field. Five hundred ears of corn were taken from the field in 1915 without any selection whatever, numbered, and scored by 25 judges. Later a portion of each ear was shelled and planted in separate seed plats.

The results for the first year indicate that the ears receiving the highest scores were also the best ears from the standpoint of field production. The 50 best ears, as selected by a majority of the judges, averaged 5 bu. per acre better than the bulk of the ears.

Classification of American Upland cotton, D. E. EARLE and F. TAYLOR (U. S. *Dept. Agr., Farmers' Bul. 802 (1917), pp. 28, figs. 15*).—This is a revision of Farmers' Bulletin 591 (E. S. R., 31, p. 433), based on the Official Cotton Standards as established and promulgated by the Secretary of Agriculture under the United States Cotton Futures Act (E. S. R., 35, p. 693).

Cotton production in the Belgian Kongo, P. JANSSENS (*Bul. Agr. Congo Belge, 7 (1916), No. 1–2, pp. 131–157, figs. 14*).—A detailed review of the introduction and subsequent development of the cotton industry in the Belgian Kongo.

The development of cotton culture in French West Africa, J. BARRE (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 5, pp. 141–148*).—A general discussion of the possibilities of cotton production in the regions of Senegal and Niger.

The opportunities for cotton production in the French colonies, J. DYBOWSKI (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 5, pp. 149–155*).—This is a general discussion directly bearing on the subject noted above. The economic necessity and desirability of developing the cotton industry in the territories of Senegal and the Sudan are emphasized.

Hemp culture in France, H. BLIN (*Jour. Agr. Prat., n. ser., 30 (1917), No. 4, pp. 34–36, figs. 4*).—A general discussion of the present status and future possibilities of hemp production in France.

The resources of Indo-China in oleaginous plants, BEENIER (*Compt. Rend. Acad. Agr. France, 3 (1917), No. 7, pp. 185–195*).—A general discussion of the oil plants produced commercially in Indo-China, including brief specific notes on cotton, rubber, soy beans, castor oil, sesame, peanuts, coconuts, and other palms.

Growing potatoes under irrigation for profit, W. STUART (*Reclam. Rec. [U. S.], 8 (1917), No. 3, pp. 140–142, figs. 2*).—The factors essential to the profitable production of potatoes under irrigation are enumerated and discussed as follows: Selection of a suitable soil type, deep plowing and thorough seed bed preparation, plentiful supply of available plant food, liberal use of good seed, good cultivation, intelligent application of irrigation water, protection against insect and fungus pests, careful harvesting and storing, and proper grading and intelligent marketing of the crop.

Notes and observations on the culture of ramie, L. NAUTEFEUILLE (*Bul. Écon. Indochine, n. ser., 18 (1915), No. 115, pp. 649–718*).—A comprehensive discussion of ramie and its production, compiled largely from available literature and augmented by some personal observations of the author. A brief history of the various agencies engaged in the exploitation of the industry is included.

Rice in Argentina, C. D. GIBOLA (*An. Soc. Rural Argentina, 50 (1916), No. 8, pp. 596–620, figs. 9*).—Rice production and the extent of the industry in Argentina are discussed and brief descriptions given of the Kiusků, Carolina, and Valencia varieties.

New rice varieties, B. MARCARELLI (*Gior. Risicolt.*, 7 (*1917*), *No. 1–2, pp. [illegible], figs. 2*).—Two rice selections designated as Originario P. 7 and O. P. 6, developed by F. Sancio in the Province of Santhià from seed of Chinese origin, are described in detail. These strains are recommended as being of superior market quality. Data are presented in tabular form comparing them with the original.

Sweet clover (Melilotus), H. L. FULMER (*Ontario Dept. Agr. Bul. 235 (1916), pp. 42, figs. 10*).—The value of sweet clover (Melilotus) as a pasture, hay, and soil improvement crop is discussed at some length.

A number of original analyses are presented showing (1) the composition of sweet clover at different stages of growth, (2) the yield and composition of sweet clover hay as compared with alfalfa, red clover, alsike, and timothy, (3) the dry matter and fertilizing constituents found in the tops (stems and leaves) and roots (in first foot of soil) and in the total crop at two different stages of growth and on two types of soil, (4) the composition of sweet clover and digestibility of its protein from two different types of soil and at six different stages of maturity, and (5) the total weight of nutrients and the amount of digestible protein furnished by one acre of sweet clover at six different stages of maturity.

Fertilizing the wheat crop, C. E. THORNE (*Mo. Bul. Ohio Sta., 2 (1917), No. 7, pp. 215–218, fig. 1; 8, pp. 251–253*).—The results of experiments previously reported with acid phosphate, steamed bonemeal, and raw rock phosphate used with fresh stable manure as fertilizers for wheat are briefly noted to illustrate the value of phosphatic materials in increasing wheat production, and the value of fresh manure reenforced with a phosphorus carrier as a substitute for high-priced commercial carriers of nitrogen and potash. The relative importance of the phosphorus was shown by an increase valued at only $11 per acre where phosphorus was omitted, the nitrogen and potassium carriers remaining unchanged, as compared with an increase amounting to $39 upon the addition of acid phosphate valued at $2.60.

Acid phosphate versus raw phosphate rock—relative prices will determine the choice for wheat this fall, C. G. WILLIAMS (*Mo. Bul. Ohio Sta., 2 (1917), No. 8, pp. 249, 250*).—The relative value of raw rock phosphate and acid phosphate for wheat is briefly considered in the light of experiments previously noted (E. S. R., 31, p. 217). The more profitable return in these tests was obtained from the investment in acid phosphate.

Adzuki beans and jimson weeds.—Favorable class material for illustrating the ratio of Mendel's law, A. F. BLAKESLEE and B. T. AVERY (*Jour. Heredity, (1917), No. 5, pp. 125–131, figs. 4*).—The authors discuss the adaptability of the adzuki bean (*Phaseolus mungo*) and the jimson weed (*Datura stramonium* and *D. tatula*) as material for illustrative purposes in classes in genetics.

The closeness of the ratios to expectations in the jimson weed is indicated in summarized data on pigmentation and capsule characters obtained in connection with other studies. A study of variability in jimson weed is being made by the senior author.

The Canadian Seed Growers' Association and its work (*Ottawa: Associa[illegible], pp. 8, figs. 2*).—This is a brief outline of the organization, purpose, and methods of procedure of the Canadian Seed Growers' Association, together with brief descriptions of some of the more important varieties of wheat, oats, barley, and peas distributed.

A method for determining the impurity of cereals caused by the seed of Agrostemma githago, A. AINATA (JANATA) (*Iuzh. Russ. Selsk. Khoz. Gaz., 17 (1915), No. 47, pp. 6–8; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 9, pp. 1272, 1273*).—A total of 1,820 seeds of

A. githago, taken from samples of oats, barley, rye, and wheat collected [illegible] districts of the Government of Kharkov, were weighed, and the average [illegible] of one seed found to be 0.0101 gm. The weight of individual seeds [illegible] between 0.0128 gm. and 0.0056 gm.

HORTICULTURE.

[Report on horticultural investigations at the Troup substation]. W. [illegible] Hotchkiss (*Texas Sta. Bul. 209 (1917), pp. 13–33, figs. 3*).—Data are [illegible] fertilizer experiments conducted with watermelons in 1904 and 1905, and [illegible] strawberries in 1907, 1908, and 1909. As a result of these tests mixtures of [illegible] phosphate and cottonseed meal are advised, both for watermelons and [illegible] berries.

Sixty-eight varieties of peaches and 105 varieties of grapes tested at the [illegible] station are here described, and varieties recommended both for market [illegible] home use.

Report of the horticultural experiment station, Vineland station, Ontario, 1906–1915 (*Rpt. Hort. Expt. Sta., Vineland, Ont., 1906–1915, pp. 76, figs. 7*). This report comprises as a whole a record of the work of the Vineland station, Ontario, from the time of its establishment in 1906 up to October, 1915.

Most of the experimental work has been started in different years since [illegible] and consists of plant breeding, variety tests, and various cultural investigations with orchard and small fruits and vegetables. A record is given of all experiments made with fruits and vegetables, together with lists of varieties being tested and the results to date of the more important cultural experiments.

Plant breeding at the horticultural experiment station, Vineland, L. Palmer (*Canad. Hort., 40 (1917), No. 11, pp. 286, 287, figs. 3*).—A summarized record of breeding experiments with fruits at the Vineland station, Ontario, in 1916 and 1917.

[Vegetables at Wisley, 1915–16] (*Jour. Roy. Hort. Soc., 42 (1917), pt. 2–3, pp. 400–411*).—Notes are given on a number of varieties of cabbage [illegible] at Wisley in 1915 and 1916.

Rules and regulations promulgated under authority of the Federal Standard-Barrel Law (*U. S. Dept. Com., Bur. Standards Circ. 71 (1917), pp. [illegible]*). Rules and regulations are given under the act previously described (E. S. R., 32, p. 499).

[Directions for the control of insect pests and diseases] (*Utah State Bd. Com. Bul. 1, rev. (1916), pp. 64*).—This bulletin briefly describes the more important insect pests and diseases of fruits and vegetables, and gives directions for their control. The text of the horticultural laws of Utah, regulations of the State Horticultural Commission, and the law governing the marketing of closed packages of fruit are also given.

Dusting for tender fruits and apples, L. Caesar (*Ann. Rpt. Fruit Growers' Assoc. Ontario, 48 (1916), pp. 47–51*).—A comparative test of dust and liquid sprays was carried out in 1916 on apples, plums, sweet cherries, peaches, and grapes in various orchards in Ontario.

Although the results were somewhat in favor of the dust method in the experiment, less favorable results from dusting were reported by others in Ontario and in New York State. Hence it is recommended that growers not purchase dusting machines until further comparative studies have been made.

Dusting as a substitute for spraying.—History and progress, H. H. Wetzel (*Ann. Rpt. Fruit Growers' Assoc. Ontario, 48 (1916), pp. 37–41*).—The

...a review of studies conducted at the New York Cornell Experiment Sta... (E. S. R., 34, p. 738), including a summary of results secured in coopera... demonstration tests in New York apple orchards in 1916. Although the ... of dusting as compared with spraying were less favorable in these co... tests than in the experimental work, the author is of the opinion ... the failure was due to inexperience in the dusting method, use of improp... prepared mixtures, and poor dusting machinery rather than to the prac... of dusting itself.

New creations in fruits, N. E. HANSEN (*Minn. Hort.*, *45* (*1917*), *No. 12, pp.* ... *figs. 4*).—This paper comprises a brief statement of progress being ... in the author's work of breeding hardy fruits (E. S. R., 37, p. 142).

A number of plums recently sent out for trial are described. Of a large ... of cherries tested at the South Dakota Experiment Station one variety, ... from a number of imported seedlings and which has been named Mos... has been found to be both productive and perfectly hardy and was dis... for testing in the spring of 1917.

A list of the most desirable varieties of most kinds of fruits (*London: ... Hort. Soc., 1916, pp. 190*).—The list herein given was prepared by the ... committee of the Royal Horticultural Society of England as a result of ... sent out to growers throughout the United Kingdom. A series of ... lists, prepared by a number of gardeners living in various parts of ... United Kingdom, is given of varieties which they consider most suitable ... their various geographical divisions.

Grass mulch.—A practical system of orchard management, J. H. GOURLEY (*... Rpt. Vt. State Hort. Soc., 14 (1916), pp. 36–41*).—In connection with or... management studies being conducted at the New Hampshire Experiment ... (E. S. R., 36, p. 724), a grass mulch experiment was recently estab... on a small orchard. Various fertilizers were applied to the different ... Data are here given showing the results secured in 1916.

The average yield of apples from the check rows was 10.5 bbls., from the ... rows 23.5 bbls., and the average from the rows fertilized with potash, ... or phosphate, but not including nitrogen, about 11 bbls. Although ... of the apples was not so good on the nitrogen plat the increase in ... far outweighed the color factor and all the apples were sold at ... price. The results in general indicate that nitrogen is the only fer... to yield a profit, and that in this orchard at least the mulch system ... be far from efficient unless supplemented with nitrogen.

Orchard cover crops for the Moutere Hills, W. C. HYDE (*Jour. Agr. [New ... 13 (1916), No. 6, pp. 472–477, figs. 7*).—The author outlines cooperative ... ments being conducted in the Moutere district of New Zealand to deter... the leguminous crop best suited for green manuring purposes in the young ... of that locality. The experiments also included trials of various fer... combinations.

The crops tested were crimson clover, common vetch, white lupine, yellow ... white mustard, serradella, and partridge peas. The best results were ... with white lupine and white mustard, together with an application of ... per acre each of blood and bone, acid phosphate, and muriate of potash.

Important factors in the successful cold storage of apples, H. S. BIRD (*Rpt. ... Mont. State Hort. Soc., 19 (1916), pp. 54–56*).—A brief discussion of the ... essential to the successful cold storage of apples, including some experi... data illustrating the damage by scald and decay due to storing immature ... fruit, over-mature fruit, and to delay in storage after picking the fruit.

The history and development of the red currant, E. A. BUNYARD (*Jour. ... Hort. Soc., 42 (1917), No. 2–3, pp. 260–270, pls. 6*).—A paper on this sub-

ject read before the Royal Horticultural Society, London, on September [illegible], 1916.

A bibliography of cited literature is appended.

Viticulture, P. Pacottet (*Viticulture. Paris: J. B. Baillière & Sons, [1917]. 2. ed., rev. and enl., pp. 554, figs. 217*).—This is one of the volumes of the Encyclopédie Agricole, published under the direction of G. Wery.

The introductory chapter contains a brief survey of the genus Vitis. Succeeding chapters deal with the anatomy and physiology of the grape, factors influencing quality and production, the viticultural geography of France and other countries, the details of grape growing, ampelography and reconstruction of vineyards, and the maladies and enemies of the grape.

Citrus culture in Japan, China, and Formosa, C. P. Clausen (*Mo. Bul. State Hort. Cal., 6 (1917), No. 10, pp. 379–388, figs. 5*).—A brief account of citrus methods employed in Japan, China, and Formosa.

Some abnormal water relations in citrus trees of the arid Southwest and their possible significance, R. W. Hodgson (*Univ. Cal. Pubs. Agr. Sci., 2 (1917), No. 3, pp. 37–54, pl. 1, figs. 2*).—This paper deals with one phase of the investigation of a so-called physiological disease, June drop of the Washington navel orange.

As a result of observations and experiments, here noted, it was found that an abnormal water relation obtains periodically in citrus foliage and in the young fruits during the hot growing season in the dry interior valleys of California and Arizona. A diurnal decrease in water content of the fruits occurs during the afternoon and is accompanied by a considerable increase in the water deficit of the leaves. "Negative pressures of considerable magnitude are found in the water columns of citrus trees under these climatic conditions. These attain their maximum during the afternoon. The dropping of the fruits appears to be most severe where the above-mentioned water relations are most abnormal. Inasmuch as in the case of certain other plants the abscission of young fruits has been shown to be due to abnormal water relations it is suggested that such may be the case here."

Optimum moisture conditions for young lemon trees on a loam soil, L. W. Fowler and C. B. Lipman (*Univ. Cal. Pubs. Agr. Sci., 2 (1917), No. 2, pp. 35–36, pls. 3, fig. 1*).—In the experiment here described, which was conducted on the Limoneira Ranch, Santa Paula, Cal., studies were made of the optimum moisture content of a rather heavy loam soil for young Lisbon lemon trees grown in cylinders. The data obtained in the course of the first two years of the work are summarized as follows:

"A moisture percentage of 20 based on the dry weight of the soil has produced the tallest trees. Trees grown with 16 and 18 per cent of moisture were not as tall as those grown with 20 per cent of soil moisture, show better color and more vigor. The differences are not very marked, however.

"The foregoing facts seem to show that the range of optimum or near optimum moisture percentages for the soil and plant in question is a relatively wide one. Much more visible damage results to the young lemon trees from moisture percentages in excess of the optimum than from those below the optimum. Every successive increment of moisture beyond the optimum is accompanied by a sharp depression in growth, color, and general vigor of the trees. Every successive decrement of moisture from the optimum shows only a relatively slight depression in growth.

"The theoretical wilting point and the moisture equivalent for the soil studied are in close accord, respectively, with the actual wilting point as determined in the soil of the orchard and the optimum moisture content as determined in the experiment discussed above."

Orange culture, A. DE MAZIÈRES (*La Culture des Orangers. Paris: J. B. Baillière & Sons, 1917, pp. 96, figs. 28*).—A small treatise on the planting, culture, harvesting, and marketing of oranges.

The fig in Texas, A. T. POTTS (*Texas Sta. Bul. 208 (1917), pp. 41, figs. 13*).—A treatise on fig growing, with special reference to the development of the industry in Texas. Information is given relative to the climatic requirements of the fig, propagation, varieties, soil and its preparation, planting, culture, pruning, fertilizers, insects and diseases, splitting and souring, harvesting and marketing fresh fruit, preserving and drying, and the Smyrna fig and caprification. The subject matter is based upon observations made in Texas and upon the industry as developed in other sections of the United States.

The guavas of the Hawaiian Islands, V. MACCAUGHEY (*Bul. Torrey Bot. Club, 44 (1917), No. 11, pp. 513–524*).—A descriptive account of the species and forms of guavas established in the Hawaiian Islands.

The pollination of the mango, W. POPENOE (*U. S. Dept. Agr. Bul. 542 (1917), pp. 20, pls. 4, fig. 1*).—This bulletin reports pollination studies conducted at Miami, Fla., during 1915 and 1916 to throw some light on the failure of many of the best imported varieties of mangoes to fruit satisfactorily in Florida. The flower structure, pollen, process of pollination, production of fruit, and flowering habits of the mango are considered in detail.

The author's experimental work shows that the mango requires pollination for the production of fruit and is benefited by cross-pollination, though normally self-fertile. The exclusion of insects is detrimental to pollination, but even in the presence of insects a large proportion of the stigmas are unpollinated and comparatively few stigmas receive more than one or two grains of pollen. Hand pollination with an abundance of pollen failed to improve fruit production. The failure to set fruit is not deemed to be due to any morphological defect of the pollen or to defects in the mechanism of pollination, hence it is concluded that the problem is a physiological one connected with nutritional conditions, as influenced by changes in soil moisture and food supply, principally the former. Experiments have been undertaken in cooperation with E. J. Kraus, of the Citrus Experiment Station, who is working with pomaceous fruits, to test the practicability of inducing the formation of flower buds through ringing, girdling, and banding the limbs with wire.

Some results with oil palm (Elæis guineensis), W. M. VAN HELTEN (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Cultuurtuin, No. 8 (1917), pp. 22, pl. 1*).—Data are given showing the yields of nuts and oil secured in 1916 from oil palms growing in the Buitenzorg Gardens and vicinity. These yields are compared with yields secured in other countries. Notes are also given on methods of propagation and planting the oil palm, based upon tests conducted at Buitenzorg and elsewhere.

Coffee in Abyssinia, A. SPALLETTA (*Agr. Colon. [Italy], 11 (1917), Nos. 1, pp. 76–88; 2, pp. 111–132, pls. 2; 3, pp. 196–222, pl. 1; 4, pp. 284–297*).—An account of the coffee industry in Abyssinia, including a discussion of varieties, soil and climate, cultural details, harvesting and preparation for market, commerce, transportation, and the future of the industry. A bibliography of related literature is appended.

A review of coffee plantings in the Buitenzorg experimental garden, C. J. J. VAN HALL and W. M. VAN HELTEN (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Cultuurtuin, No. 7 (1917), pp. 50, pls. 8*).—Notes are given on the character and condition of plantings of various species, hybrids, and varieties of coffee under observation at Buitenzorg.

The germination and selection of tea seed, C. BERNARD (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 1 (1917), pp. 1–12, pl. 1*).—A translation of an ar-

tiele dealing with the author's experiments on the germination and [illegible] of ten seed (E. S. R., 30, p. 742; 35, p. 745).

[Flowers at Wisley, 1916] (*Jour. Roy. Hort. Soc., 42 (1917), No. [illegible], pp. 412–429*).—This comprises notes on variety tests of a number of [illegible] ers conducted at Wisley in 1916.

Daffodil developments, J. Jacob (*Jour. Roy. Hort. Soc., 42 (1917), No. [illegible], pp. 229–235*).—A brief historical review of the work of improvement in [illegible] fodils.

The practical book of outdoor rose growing for the home garden, [illegible] Thomas, jr. (*Philadelphia and London: J. B. Lippincott Co., 1917, [illegible] pp. 215, pls. 120*).—The present edition of this work (E. S. R., 32, p. 332) has largely rewritten to include improved cultural practices and revised [illegible] the best varieties of dwarf and climbing roses based on recent tests.

Observations on tulips, A. B. Stout (*Jour. Hort. Soc. N. Y., 2 (1917), No. [illegible], pp. 201–206, pls. 2*).—Experiments conducted at the New York Botanical [illegible] den indicate that it is difficult to attribute "blindness" of tulips to any [illegible] cause. Cultural tests made with two varieties prove that blind tulips [illegible] bloom excellently in the following year. Hence, they are not necessarily "run-down" or "run-out" bulbs. Different varieties have performed differently with respect to blindness under quite identical conditions of treatment and [illegible]

Data are also given showing the performance of sister bulbs of different sizes, and especially those of the smaller size, with respect to blooming, blindness, and scaling. Further observations are to be made on the performance of small bulbs which produced flowers in the experiment.

Report of the tulip nomenclature committee, 1914–15, Bowles [illegible] (*London: Roy. Hort. Soc., 1917, pp. 16½, pls. 22*).—A report of the tulip nomenclature committee of the Royal Horticultural Society of England, in which is presented a scheme for the classification of garden tulips, descriptions of certain tulips as tested at Wisley, descriptions of new cottage tulips, list of species, alphabetical list of tulip names, and a bibliography on tulips.

FORESTRY

The development of forest law in America, J. P. Kinney (*New York: John Wiley & Sons, Inc., 1917, pp. XVIII+25½+XVI*).—A historical presentation of the successive enactments, by the legislatures of the 48 States of the American Union and by the Federal Congress, directed to the conservation and administration of forest resources.

Recent forestry propaganda in the Philippines, F. Sherfesee (*Journal of Forestry, 15 (1917), No. 6, pp. 740–756*).—The author reviews the forest problem in the Philippines and sketches the present attitude of the Filipinos with respect to forest activities.

Practical reforestation, H. S. Graves (*Proc. Cut-Over Land Conf. South, 1917, pp. 15–23*).—In this paper the author briefly summarizes the present status of cut-over pine land areas in the South and urges cooperation between public and private agencies in developing methods for the systematic use of these lands for grazing, agriculture, and forestry.

How Louisiana is solving the reforestation problem, M. L. Alexander (*Proc. Cut-Over Land Conf. South, 1917, pp. 169–172*).—A brief summary of reforesting operations being conducted under the direction of the Department of Conservation of Louisiana.

An improved transplanting lath, J. Lyford-Pike (*Trans. Roy. Scot. Arb. Soc., 31 (1917), pt. 2, pp. 160, 161, pl. 1*).—A lath or board designed for [illegible] planting a large number of tree seedlings or other plants in one operation is described and illustrated.

The preservation of leafy twigs of the beech, L. A. BOODLE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 6 (1917), pp. 220–231*).—Experiments reported by the author indicate that leafy twigs of the common beech may be preserved for several months with very little wilting by cutting the twigs when the leaves are still green and placing the stems in a solution of calcium chlorid for about a week. The best results were secured by using solutions with specific gravities of 1.4 and 1.2. The lower ends of the twigs were trimmed every day or two to present freshly cut surfaces to the liquid and the twigs were exposed to direct sun for several hours during the treatment.

The importance of plantation margins, A. MURRAY (*Trans. Roy. Scot. Arbor. Soc., 31 (1917), pt. 2, pp. 156–159*).—A short paper on the selection of species for and the subsequent management of forest plantation margins or shelter belts.

Trees for nonirrigated regions in eastern Colorado, W. J. MORRILL (*Colo. Agr. Col. Ext. Serv. Bul., 1. ser., No. 123 (1917), pp. 20, figs. 6*).—A descriptive list of trees and shrubs, including notes on their general behavior in eastern Colorado, is given, together with suggestions on tree planting.

Forest succession and rate of growth in sphagnum bogs, G. B. RIGG (*Jour. Forestry, 15 (1917), No. 6, pp. 726–739, figs. 3*).—A discussion of forest succession and rate of growth in six bogs of the Puget Sound region and four in Alaska, based on field observations conducted for several years.

Aspen as a permanent forest type, J. M. FETHEROLF (*Jour. Forestry, 15 (1917), No. 6, pp. 757–760*).—In this paper the author brings out the more pertinent features of aspen as a type, based on its behavior in habitats like the semiarid intermountain region.

The pitch pine, L. PICCIOLI (*Ann. R. Ist. Sup. Forestale Naz. Firenze, 2 (1916–17), pp. 401–431, pls. 4, figs. 6*).—An account of the various species of pine commonly known as pitch pine with reference to their distribution, botanical characters, technical properties, and culture in Europe. The account is prepared with special reference to the selection of species adapted to Italian silviculture.

Notes on white pine 4-year transplants, S. N. SPRING (*Jour. Forestry, 15 (1917), No. 6, pp. 761, 762*).—A growth record is given of white pine seedlings grown from three seed beds which were sown broadcast with different quantities of seed.

The density of stand and rate of growth of Arizona yellow pine as influenced by climatic conditions, F. SHREVE (*Jour. Forestry, 15 (1917), No. 6, pp. 695–707, figs. 6*).—A contribution to our knowledge relative to the influence of climate on tree growth, based on observations and measurements made in the Santa Catalina Mountains in southern Arizona. Data are given showing the differences in population of the Arizona yellow pine at different altitudes, the differences in the character of the populations, and the differences or similarities in the rate of growth at the several elevations.

Probable error in field experimentation with Hevea, O. F. BISHOP, J. BANTHAM, and M. D. KNAPP (*India-Rubber Jour., 54 (1917), No. 15, pp. 13–16, 22, fig. 1*).—A review of recent literature on the subject, including actual records of experiments in Sumatra showing variations that may occur among carefully chosen experimental plats and the need of applying probable error methods. An example is given of the application of the probable error method to a series of 26 tapping experiments which were carried on in triplicate.

Seed selection in the cultivation of Hevea brasiliensis, T. PETCH (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 3 (1917), pp. 118–120*).—A brief ac-

count is given of seed selection studies of Hevea conducted under the dir... of the Ceylon Department of Agriculture.

The effects of tapping and wintering on the storage of plant food in Hevea, A. A. L. RUTGERS (*Arch. Rubbercult. Nederland. Indië, 1 (1917), No. 1; Meded. Alg. Proefstat. Alg. Ver. Rubberplanters Oostkust Sumatra, Ser., No. 1–2 (1917), pp. 1–8, pls. 3*).—A brief summary of investigations this subject conducted by Campbell and Bateson (E. S. R., 33, p. 543; 34, ... 47, 240, 346). These authors are of the opinion that tapping should be stop... from the moment the new leaves are coming out until a week after the ... is full-grown. The reviewer, on the other hand, concludes that wintering ... only one-sixth of the starch reserve at the most, and since tapping takes p... tically none from a physiological point of view there is no reason to ... tapping during the winter.

Rubber soils in Fiji, C. H. WRIGHT (*Dept. Agr. Fiji Pamphlet 26 (1917), ... 2*).—This pamphlet contains directions for distinguishing soils adapted ... rubber growing in Fiji.

Annual progress report on forest administration in the Presidency of Bengal for the year 1915–16, H. A. FARRINGTON (*Rpt. Forest Admin. Bengal, 1915–16, pp. 11+51+5*).—This is the usual report relative to the administ... and management of the State forests of the Presidency of Bengal, includ... financial statement for the year 1915–16. All important data relative to ... tions in areas, forest surveys, working plans, forest protection, miscella... work, yields, revenues, expenditures, etc., are appended in tabular form.

Forest Service stumpage appraisals, J. W. GIRARD (*Jour. Forestry, (1917), No. 6, pp. 708–725*).—This article deals with the appraisal of ... material and the logging methods employed in Montana, Idaho, and nort... Washington.

Marketing farm woodlot products in Maine, G. N. LAMB (*Univ. Maine ... Bul. 113 (1917), pp. 38, figs. 5*).—This bulletin, which is published in co... tion with the Forest Service of the U. S. Department of Agriculture, ... cusses the woodlot situation in Maine; the common woodlot trees, inclu... their growth, uses, and properties; estimating standing timber and saw ... methods of selling timber; and the preparation and marketing of woo... products destined for various industries.

Crossties purchased and treated in 1915, A. M. MCCREIGHT (*U. S. Dept. ... Bul. 549 (1917), pp. 8*).—A statistical review for the year 1915. The total ... ber of crossties bought by all classes of producers was approximately ... 402,611. Treating plants reported a total of 37,085,585 crossties treated in ...

DISEASES OF PLANTS.

Common and scientific names of plant diseases, M. B. WAITE (*... Phytopathology, 7 (1917), No. 1, p. 60*).—The author makes a plea for ... common names for plant diseases which can attain proper status in discuss... literature, dictionaries, quarantine regulations, laws, and legal proceedings.

[Plant diseases in British Guiana], C. K. BANCROFT (*Rpt. Dept. Sci. ... Agr. Brit. Guiana, 1914–15, App. 2, pp. 7–10*).—Besides a summary of organ... causing diseases of cultivated crops in the colony during three years, brief ... tails are given of the South American leaf disease of Hevea (*Fusicla... macrosporum*); the dry disease (*Marasmius sacchari*) and the ring ... (*Leptosphæria sacchari*) of sugar cane; the fruit disease of mango and ... fruit (*Glœosporium mangiferæ*); witches' broom of cacao; a disease of ... and fruit of the coffee plant due to a Colletotrichum (*C. coffeæ ?*); the ... disease of plantains; blast of rice (*Piricularia oryzæ*); collar rot of ...

citrus knot; bud rot of coconut palm; root disease (*Fomes semitostus*) of Hevea; rose mildew (*Sphærotheca pannosa*); black blight (*Dimerosporium mamiferum*) of Hibiscus, Ixora, Barbados cherry, and Bougainvillea, besides several other plants; and a bacterial disease of orchids.

Sclerotrichum graminis on timothy, orchard grass, and other grasses, A. G. JOHNSON and C. W. HUNGERFORD (*Abs. in Phytopathology, 7 (1917), No. 1, p. 60*).—The authors report having observed *S. graminis* on timothy and orchard grass at various points from Wisconsin to the Pacific coast. The fungus is said to cause a serious disease of these hosts, especially in Wisconsin. A number of other species of grass are reported as hosts of the fungus, and observations at Madison, Wis., are considered to show that it overwinters readily in tufts of orchard grass and timothy.

Bacteria of barley blight seed-borne, L. R. JONES, A. G. JOHNSON, and C. S. REED (*Abs. in Phytopathology, 7 (1917), No. 1, p. 69*).—In continuation of a previous study of a bacterial blight of barley (E. S. R., 35, p. 845), the authors have given special attention to the dissemination of the disease over long distances, and they conclude that the organism may be carried with the seed grain and remain viable after at least two years of dormancy. Preliminary experiments are said to indicate that the organism may be destroyed by seed disinfection.

Corn disease caused by Phyllachora graminis, NORA E. DALBEY (*Phytopathology, 7 (1917), No. 1, pp. 55, 56, fig. 1*).—A brief account is given of observations on the fungus *P. graminis* on leaves of maize collected in Porto Rico. A detailed description of the disease and fungus is to be given in a subsequent publication.

Smut diseases of wheat, W. B. MERCER (*Jour. Bd. Agr. [London], 23 (1916), No. 7, pp. 633–643, figs. 2*).—Along with a brief discussion of several smuts of economic cereals, the author gives brief notes of studies, to be published elsewhere in greater detail, regarding the life history of *Ustilago tritici*, the cause of loose smut of wheat.

The fungus is said to be capable of entering the young grain, but not the seedling. The chlamydospores germinate inside the flower and the tube penetrates the immature grain, giving rise to a small amount of mycelium in the embryo and the starchy endosperm, the grain developing in spite of this fact. When the infected grains are sown, the fungus grows with the young plant in a way similar to that of the bunt fungus. When the head begins to form, the mycelium begins to grow more rapidly, branches profusely, and forms a large number of spores, which are at first held together by a gelatinous substance enclosed in a thin membrane which usually ruptures as the ear emerges. Unless these spores thus freed reach a flower they become harmless, probably in a few days.

The control measures tried up to the present time are outlined. The fungus can not be reached with chemical fungicides. The method of picking out the smutted heads from the standing crops, while fairly effective, is not practicable on a large scale. Selection of seed on the basis of size or weight is ineffective. Steam has given some fair results, but is not considered safe as a seed treatment. Forcing hot water through the seed grain is impracticable. Hot-air kilns do not heat the grain evenly. Rolling the grain in heated drums has met with a measure of success. The treatment found most effective is to soak the wheat in water at a temperature of 25 to 30° C. (77 to 86° F.) for four hours and then for 10 minutes at 52 to 54° C. (125.6 to 129.2° F.), this treatment destroying the fungus with a comparatively slight lowering of germinability.

Tylenchus tritici on wheat, L. P. BYARS (*Phytopathology, 7 (1917), No. 1, pp. 56, 57*).—The author reports having determined the presence of the nematode *T. tritici* in wheat heads transmitted through the Office of Cereal Investigations of this Department from Nanking, China. The data presented are offered in order that mensures can be taken to prevent the introduction of the parasite with wheat importations from infested countries.

Bean diseases in New York State in 1916, W. H. BURKHOLDER (*Abs. in Phytopathology, 7 (1917), No. 1, p. 61*).—In continuation of a report on diseases of the field bean (E. S. R., 36, p. 248), the author states that the most serious disease is due to a species of Fusarium which is considered nearly identical with *F. martii*. This causes a dry root rot of the bean plant. The organism is able to winter over in manure where bean straw has been used as feed, and there is evidence that it may live for several years in the soil. All varieties of beans are about equally susceptible to the attack of this fungus, although certain undesirable types of the white marrow are very resistant, and a few individuals of these have been selected for breeding experiments.

A blight, caused by *Bacterium phaseoli*, and mosaic are said to have been rather conspicuous in the bean crop of 1916, while the anthracnose which was destructive in 1915 caused little damage in the following year. The author claims that there is some indication that *B. phaseoli* causes a stem girdling.

Bacterial diseases of celery, W. S. KROUT (*Abs. in Phytopathology, 7 (1917), No. 1, p. 64*).—The author gives a description of a crown rot of celery which appears to be caused by a bacterium working simultaneously with a species of Fusarium, a crown rot wilt, and a bacterial heart wilt.

Wintering of Septoria petroselina apii, W. S. KROUT (*Abs. in Phytopathology, 7, (1917), No. 1, p. 65*).—As a result of the author's studies, it is believed that the above fungus is not carried on celery seed but in manures containing diseased, decomposed plants and probably by other methods. Laboratory investigations have shown that heating celery seed at 50° C. (122° F.) for half an hour will eliminate all chances, if there are any, of the disease being disseminated through the seed and pedicles.

Dissemination of the organism of cucumber anthracnose, M. W. GARDNER (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 62, 63*).—The author presents evidence indicating that this disease of cucumbers is introduced by the seed and that subsequent spread is largely due to surface drainage.

Do the bacteria of angular leaf spot of cucumber overwinter on the seed?, E. CARSNER (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 61, 62*).—The fact that angular leaf spot appeared only on seedlings in six fields planted with seed from the same source and not in other fields in the vicinity is considered by the author as a basis for the hypothesis that the causal organism is seed-borne.

Preliminary notes on a new leaf spot of cucumbers, G. A. OSNER (*Abs. in Phytopathology, 7 (1917), No. 1, p. 62*).—During the seasons of 1915 and 1916 the author's attention was called to a peculiar leaf spot on cucumbers which was causing more or less damage in a number of fields. The spots for the most part were small and limited by the veins of the leaf. The disease is claimed to be due to a fungus, the exact generic position of which has not yet been determined.

Virulence of different strains of Cladosporium cucumerinum, W. W. GILBERT (*Abs. in Phytopathology, 7 (1917), No. 1, p. 62*).—As a result of investigations the author has found that different strains of *C. cucumerinum* vary widely in their ability to infect cucumber plants, some virulent strains killing the plants in two to four days, while nonvirulent strains failed to produce infection. Similar results were obtained from the inoculation of young cucumbers in moist chambers.

A nematode disease of the dasheen and its control by hot-water treatment, L. P. BYARS (*Abs. in Phytopathology, 7 (1917), No. 1, p. 66*).—The dasheen (*Colocasia esculenta*) is reported as having been found attacked by a nematode (*Heterodera radicicola*). The disease, it is claimed, can be successfully controlled by planting on uninfected land selected cormels from disease-free areas or diseased cormels which have been treated with water at 50° C. (122° F.) for 40 minutes.

A bacterial stem and leaf disease of lettuce, NELLIE A. BROWN (*Abs. in Phytopathology, 7 (1917), No. 1, p. 63*).—A wilt disease of lettuce is briefly reported, the disease having been observed in Beaufort County, S. C., in 1916. The affected plants were wilted and rotting was often rapid. Bacteria were abundant, and the organism isolated, when inoculated into lettuce, produced the blue-green color throughout the vascular system and pith which characterizes the normal appearance of the disease. The organism in its morphological and cultural characters is said not to correspond to any recorded as pathogenic to lettuce.

Studies upon the anthracnose of the onion, J. C. WALKER (*Abs. in Phytopathology, 7 (1917), No. 1, p. 59*).—It is claimed that a morphological study of the organism *Colletotrichum circinans* confirms the findings of Voglino that the fungus belongs to the genus Colletotrichum and not Vermicularia. Inoculation of the fungus from onion into apple fruits is said to have resulted in a rot very similar to the Volutella rot, but further study is necessary before the two fungi can be considered identical.

The fungus is said to winter over in the soil and consequently the disease is most severe on old onion fields. Spraying the bulbs before harvest or in the fields after harvest has not proved beneficial. Yellow and red varieties of onion are claimed to be highly resistant, and this fact is believed to offer encouragement for the development of a resistant white strain.

Pink root, a new root disease of onions in Texas, J. J. TAUBENHAUS and A. D. JOHNSON (*Abs. in Phytopathology, 7 (1917), No. 1, p. 59*).—A new disease of onions locally known as pink root is said to occur in Webb County, Tex., but only where onions are grown for two or more years on the same land. The roots of the affected sets in the seed bed or of the plants in the field turn pink in color, shrivel, and die. As fast as new roots are formed they become infected and the normal development of the bulbs is affected. The undersized bulbs resulting are worthless so far as market is concerned.

The cause of the disease has not yet been determined.

Black spot of pepper, L. E. MELCHERS and E. E. DALE (*Abs. in Phytopathology, 7 (1917), No. 1, p. 63*).—A disease of peppers is described with which a species of Alternaria has been constantly associated. Inoculation experiments have shown that the organism is only weakly pathogenic to normal tissue and that it becomes established largely through injuries to peppers in the field, the principal means being sun scald and frost injury.

Notes on curly dwarf symptoms on Irish potatoes, W. L. BURRELL (*Abs. in Phytopathology, 7 (1917), No. 1, p. 71*).—Curly dwarf symptoms are said to have been very prevalent in Iowa during 1916, particularly on the varieties Irish Cobbler, Rural New Yorker, and Early Ohio. The disease made its appearance in the early plantings about June 10 and developed throughout the season. In August, plants that had been normal up to that time showed typical signs of curly dwarf on the foliage, and the upper third of the plants had shortened internodes and crinkled and curled leaves, giving the plants a bushy appearance. These symptoms are said to have been induced in the field by the hot, dry weather in August, and similar ones were later artificially developed in the

laboratory. The plants showing these symptoms put forth normal foliage again in September with the advent of cooler weather.

Histological studies showed that the crinkling of the leaves was due to the necrosis of certain epidermal and cortical cells of the veins, followed by the growth of the parenchyma cells which induced buckling of the leaf surface. Transpiration experiments indicated that dwarfed plants transpire more rapidly than normal ones.

Notes on mosaic symptoms of Irish potatoes, I. E. MELHUS (*Abs. in Phytopathology, 7 (1917), No. 1, p. 71*).—The author gives a description of the mosaic disease of potatoes and its effect on the production of tubers.

Frost necrosis of potato tubers, L. R. JONES and E. BAILEY (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 71, 72*).—A type of noninheritable net necrosis of potato tubers is described, of which frost injury is apparently the primary cause. Experiments under artificial conditions have shown that exposure to freezing temperature may produce either ring or net necrosis. The stem end of the tuber is reported to be always more sensitive to injury than the other.

A bacterial blight of soy beans, A. G. JOHNSON and FLORENCE M. COBURN (*Abs. in Phytopathology, 7 (1917), No. 1, p. 65*).—The authors report having had a bacterial blight of soy bean under investigation at Madison, Wis., for several years. The disease has become quite common, occurring especially on the leaves, on which the organism causes the production of small, angular spots which, in later stages, become dark in color. Repeated isolation cultures have yielded a characteristic organism which is referred to the genus Pseudomonas. Studies on the physiological characteristics of the organism and its pathogenicity are said to be in progress.

Further note on a parasitic saccharomycete of the tomato, A. SCHNEID (*Phytopathology, 7 (1917), No. 1, pp. 52, 53*).—In continuation of investigations of a disease of tomato previously reported (E. S. R., 36, p. 749), the author has concluded that the fungus is a new species, and it is technically described under the name *Nematospora lycopersici*.

Host limitations of Septoria lycopersici, J. B. S. NORTON (*Abs. in Phytopathology, 7 (1917), No. 1, p. 65*).—Inoculation experiments in humid indoors on seedlings of a number of species of Solanaceæ and 80 varieties of tomato with Septoria from tomato are said to have resulted in infectious on several species of Solanum, eggplant, *Datura tatula*, potato, currant tomato, and *S. carolinense*. With larger plants outdoors, infection rarely occurs except on Lycopersicum.

Note on the genus Coniothecium, with special reference to C. chomatosporum, P. A. VAN DER BIJL (*So. African Jour. Sci., 12 (1916), No. 13, pp. 655–657, pls. 6, figs. 2*).—In view of a statement made by Massee (E. S. R., 34, p. 543), the author here presents more fully the results of an investigation previously noted (E. S. R., 32, p. 344), which has not yet been completed.

This paper notes certain cultural characters of *C. chomatosporum*, the cause of a branch blister disease on apple and pear. The fungus develops between the cells, invading the middle lamellæ and rupturing the skin to produce the black blisters and fruit russeting. Evidence obtained is said to show that the organism is only a stage in the life cycle of *Phoma mali*.

Control of peach bacterial spot in southern orchards, J. W. ROBERTS (*U. S. Dept. Agr. Bul. 548 (1917), pp. 7, pl. 1*).—A description is given of the bacterial spot of peaches caused by *Bacterium pruni*. The disease, which is also known as bacteriosis, is said to occur in practically all the peach-growing sections of the eastern half of the United States, its most serious injury being confined to the most southerly portion of this district. Twigs, fruit, and leaves are affected, but the greatest amount of injury is done to the leaves.

Experiments carried on by the author and others indicate that the disease may be kept in check in southern peach orchards by proper pruning, cultivation, and especially fertilization. Of the fertilizers used, nitrate of soda proved most efficient.

In addition to the peach, *B. pruni* is said also to cause a disease of the plum, affecting especially the Japanese varieties.

Black currant eelworm, MISS A. M. TAYLOR (*Jour. Agr. Sci. [England]*, 8 (1917), *No. 2, pp. 246–275, pl. 1, fig. 1*).—The author notes an attack of nematodes on black currant near Cambridge, England. The evidence indicates that the parasite has been established here for some time, probably having been more or less masked by its association with the black currant mite, the symptoms of the two as described being similar in some respects. Although a study which has been made of the nematode is given in some detail, its relationships have not yet been determined.

Sulphuring Concord grapes to prevent powdery mildew, F. E. GLADWIN and D. REDDICK (*Abs. in Phytopathology, 7 (1917), No. 1, p. 66*).—The authors report the dusting of Concord grapevines with sulphur-lime mixtures containing 25 and 75 per cent sulphur flour, 95 per cent or more of which would pass through a 200-mesh sieve. Comparisons were made with plants treated with Bordeaux mixture and where powdery mildew (*Uncinula necator*) was prevalent, the vines receiving the dust mixture showed much less mildew on the grape clusters, although there was considerable burning with the larger amounts of sulphur-lime.

The generation of aldehydes by Fusarium cubense, E. C. LATHROP (*Phytopathology, 7 (1917), No. 1, pp. 14–16*).—Investigations having shown that aldehydes of various chemical constitution are detrimental to plant growth, the author experimented with *F. cubense*, the cause of the Panama banana disease, and found that aldehydes were formed during the growth of the fungus on synthetic culture media. The generation of aldehydes by *F. cubense* is believed to account, in a measure at least, for the pathological action of the organism.

Citrus canker investigations at the Florida Tropical Laboratory, R. A. JUBIS (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 58, 59*).—A description is given of some cultural characteristics of the canker organism, *Pseudomonas citri*, as obtained in the laboratory. Positive results are reported to have been secured from inoculations on grapefruit, ponderosa lemon, key lime, *Citrus limetta*, sour orange, tangelo, sweet orange, tangerine, king orange, mandarin orange, and kumquat. The disease also occurs on navel orange, mandarin, satsuma, common lemon, rough lemon, and *Ægle glutinosa*.

Sour rot of lemon in California, C. O. SMITH (*Phytopathology, 7 (1917), No. 1, pp. 37–41, figs. 2*).—A description is given of a sour rot of lemons and other citrus fruits occurring during storage. The infected tissues soften, become discolored, and collapse, changing into a more or less slimy, watery mass.

A fungus has been isolated from diseased fruits which is considered identical with *Oospora citri-aurantii*, originally described by Ferraris (E. S. R., 14, p. 70). Artificial inoculations of the fungus on citrus fruits in moist chambers gave positive results with lemons, oranges, grapefruit, and tangerines, the rot appearing within 48 hours. Green fruit of lemons, as well as twigs of Eureka lemon, when inoculated, gave negative results.

From the author's experiments, it is concluded that infection of lemons with the sour rot fungus takes place only through some injury or from contact with infected fruit.

Two new camphor diseases in Texas, J. J. TAUBENHAUS (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 59, 60*).—Anthracnose of camphor, due to a species

of Gloeosporium which is tentatively named *G. camphoræ* n. sp., and a limb canker of camphor are briefly described.

Diseases of cinchona, A. RANT (*Meded. Kina Proefstat. [Dutch East India] No. 2 (1914), pp. 47, pls. 11*).—The author has listed with brief discussion the known diseases of adult plants of cinchona, grouped according to the portions affected, namely, leaves, branches, stems, and roots, and also separately the diseases affecting more particularly the young plants.

A disease of pecan catkins, B. B. HIGGINS (*Phytopathology, 7 (1917), No. 1, pp. 42–45, figs. 2*).—The author's attention was called during the spring of 1916 to an abnormality of the staminate catkins of pecans on the Georgia Experiment Station plats. An examination of the catkins showed the presence of a fungus in the infected anthers, which, while not killing the tissues outright, caused many of the pollen grains to become empty and to collapse.

A study of the trouble showed it to be due to a species of Microstroma, and as a similar fungus was observed on the leaves of hickory trees, it was suspected that the one on pecan was identical with that on hickory. Cultures of both forms were obtained and some differences were noted. Diligent search indicated that the fungus on pecan catkins differs from that on hickory, and the organism is technically described under the name *M. juglandis robustum* n. var. As pollen is always produced in great abundance by pecan trees, the loss of a comparatively large amount is considered of little importance, but the author suggests that this disease may become serious in the future.

Phytophthora on Vinca rosea, J. F. DASTUR (*Mem. Dept. Agr. India, Bot. Ser., 8 (1916), No. 6, pp. 233–242, figs. 14*).—During the wet period occurring in May and June, 1913, *V. rosea* suffered much from a parasitic fungus which was diagnosed as a Phytophthora. The attack weakens or disappears in dry weather and sunshine. The organism, which appears to be a weak parasite, has been studied by the author and is considered to be a biological strain of *P. parasitica*, previously described by him as a new species attacking the castor oil plant (E. S. R., 29, p. 548).

Notes on some species of Coleosporium, G. G. HEDGCOCK and N. R. HUNT (*Abs. in Phytopathology, 7 (1917), No. 1, p. 68*).—*C. delicatulum* is reported for the first time on two species of Euthamia, and the Peridermium form on a number of species of Pinus. The occurrence of *C. laciniariæ* on six species of Laciniaria is also reported.

The æcial stage of Coleosporium elephantopodis, G. G. HEDGCOCK and W. H. LONG (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 66, 67*).—Young trees of *Pinus heterophylla* in the greenhouse at Washington, D. C., inoculated with teliospores of *C. elephantopodis*, are said to have produced æcia of *Peridermium carneum*. Inoculations with æciospores on the leaves of *Elephantopus tomentosus* produced both uredinia and telia of *C. elephantopodis*. Parallel sets of inoculations of plants of Vernonia and Elephantopus gave results indicating the identity of the two species of Coleosporium previously reported on the two hosts. *Peridermium carneum* is reported for the first time on the needles of *Pinus caribæa*, *P. clausa*, *P. echinata*, *P. glabra*, *P. heterophylla*, *P. ponderosa*, *P. rigida*, *P. scopulorum*, and *P. serotina*.

An alternate form for Coleosporium helianthi, G. G. HEDGCOCK and N. R. HUNT (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 67, 68*).—*Peridermium helianthi* is described on *Pinus virginiana*. Inoculations made with the æciospores of the Peridermium on *Helianthus decapetalus*, *H. divaricatus*, *H. giganteus*, *H. glaucus*, and *H. hirsutus* proved the Peridermium to be the æcial stage of *C. helianthi*.

Some new hosts for Coleosporium inconspicuum, G. G. HEDGCOCK and N. R. HUNT (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 68, 69*).—The Peridermium

form of this fungus is reported for the first time on *Pinus echinata*. This material was used in inoculating *Coreopsis major* Ameleri and *C. verticillata*, resulting in the formation of uredinia and telia of *Coleosporium inconspicuum*.

The Peridermium belonging to Coleosporium ipomœæ, G. G. HEDGCOCK and N. R. HUNT (*Abs. in Phytopathology*, 7 (*1917*), *No. 1, p. 67*).—The authors describe *P. ipomœæ*, a new follicolus species on *Pinus echinata*, *P. palustris*, *P. rigida*, and *P. tæda*. Plants of *Ipomœa lacunosa*, *I. pandurata*, *I. triloba*, *Pharbitis barbigera*, *P. hederacea*, and *Quamoclit coccinea* under controlled conditions were successfully inoculated with the æciospores of this Peridermium, producing on their foliage the typical uredinia and telia of *C. ipomœæ*.

Some new hosts for Coleosporium solidaginis, G. G. HEDGCOCK and N. R. HUNT (*Abs. in Phytopathology*, 7 (*1917*), *No. 1, p. 68*).—*Peridermium acicolum*, the æcial stage of *C. solidaginis*, is reported for the first time on species of Pinus, and positive results are said to have been obtained from inoculations with the æciospores of *P. acicolum* on plants of species of Aster and Solidago.

A Peridermium belonging to Coleosporium terebinthinaceæ, G. G. HEDGCOCK and N. R. HUNT (*Abs. in Phytopathology*, 7 (*1917*), *No. 1, p. 67*).—The authors describe a new follicolus species, *P. terebinthinaceum*, occurring on *Pinus echinata*, *P. rigida*, and *P. tæda*, with a range from North Carolina to Georgia. Inoculations were made under controlled conditions with the æciospores of this Peridermium on plants of *Silphium asteriscus*, *S. integrifolium*, *S. trifoliatum*, and *Parthenium integrifolium*, and in about two weeks the uredinia and later the telia of *C. terebinthinaceæ* appeared on the leaves of all these species. *C. terebinthinaceæ* has been reported on the leaves of *S. angustum*, *S. compositum*, *S. dentatum*, *S. glabrum*, and *S. pinnatifidum*.

Notes on Cronartium comptoniæ, III, P. SPAULDING (*Phytopathology*, 7 (*1917*), *No. 1, pp. 49–51*).—In continuation of notes on this and related fungi (E. S. R., 33, p. 351), the author presents additional data.

The additional pine hosts, *Pinus densiflora*, *P. jeffreyi*, *P. luricio*, *P. mugho*, and *P. resinosa*, have been reported for *C. comptoniæ*. Uredinia have been produced on plants of *Comptonia asplenifolia* with æciospores from a number of species of Pinus. Uredinia on Comptonia were successfully used to produce uredinia on Comptonia and *Myrica gale*. Uredinia from *M. gale* produced uredinia on Comptonia.

Observations made by the author in a number of localities have shown that *Cronartium comptoniæ* fruits on pines principally in a period of seven or eight weeks, reaching its maximum about June 1, a date considerably earlier than that previously reported. The author believes that *P. rigida* is much less susceptible to the disease than are *P. ponderosa* and *P. contorta*, the loss among which has been total.

Does Cronartium ribicola winter on the currant? W. A. MCCUBBIN (*Phytopathology*, 7 (*1917*), *No. 1, pp. 17–31, fig. 1*).—In continuation of a previous note (E. S. R., 36, p. 652), the author offers data to substantiate his hypothesis that *C. ribicola* hibernates as mycelium in infected buds of currant. This is believed to be in agreement with known habits of other rusts under like conditions and of similar nature and is supported by the general and irregular appearance of the currant stage of the fungus over large areas in which there is reason to believe that there are no pine infections. Special cases where rust has occurred on currants which are distant from any possible source of infection are reported, and in one instance the only case of rust in one large black currant plantation was on two of four plants which had been badly infected in the preceding year. A report is also given of the occurrence of currant rust on plants set out in a rust-free district in order to test overwintering.

Evidence of the overwintering of Cronartium ribicola, P. SPAULDING, I.M. (*in Phytopathology, 7 (1917), No. 1, p. 58*).—The author reports that currants are frequently infected with *C. ribicola* one summer but not the next and, further, that cooperative experiments in which 500 heavily infected black currants were used resulted in no disease. The author states that he has had under observation for seven years in greenhouses in Washington, D. C., hundreds of Ribes plants used in inoculation experiments, and in no case has the disease ever appeared the next season until artificial inoculations have been made. It is claimed that infection of petioles is not so rare as has been supposed, that no evidence of bud infection by way of the petiole has been obtained, and that direct examination of buds of infected plants has failed to show the presence of the fungus.

The pine blister, B. H. PAUL (*N. Y. State Conserv. Com. Bul. 15 (1916), pp. 18, pl. 1, figs. 8*).—This is a résumé of the proceedings of a conference held by the committee for the suppression of pine blister in North America at Albany, N. Y., November 20 and 21, 1916. A general account is given of the characteristics and importance of the disease in the United States and Canada, also the result of preliminary work showing the distribution of the disease as known to date, with recommendations and other information looking toward its control.

The control of white pine blister rust in small areas, W. H. RANKIN (*in Phytopathology, 7 (1917), No. 1, p. 58*).—A brief account is given of experiments in control of white pine blister rust on 85 forest plantings in New York State. Diseased or suspicious trees and all species of Ribes were removed within 500 ft. of the plantings, and the results obtained seem to indicate that this treatment prevented the appearance of *Cronartium ribicola* in these areas.

Some new or little known hosts for wood-destroying fungi, A. S. RHOADS (*Phytopathology, 7 (1917), No. 1, pp. 46–48*).—A list is given of host species of 16 wood-destroying fungi, the species being believed to be new or at least little known hosts for these fungi, which have not been previously reported upon them.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A new subspecies of meadow mouse from Wyoming, V. BAILEY (*Proc. Biol. Soc. Wash., 30 (1917), pp. 29, 30*).

Diagnosis of a new laniine family of Passeriformes, H. C. OBERHOLSER (*Jour. Wash. Acad. Sci., 7 (1917), No. 7, pp. 180, 181*).—The family Tyrannidæ is erected.

Description of a new Sialia from Mexico, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 30 (1917), pp. 27, 28*).

Friends of our forests, H. W. HENSHAW (*Nat. Geogr. Mag., 31 (1917), No. 4, pp. 297–321, figs. 33*).—Brief accounts illustrated by colored plates, prepared by L. A. Fuertes, are given of 36 species of North American warblers.

Report of the entomologist of the Arizona Commission of Agriculture and Horticulture for the year ended June 30, 1916, A. W. MORRILL (*Ariz. Com. Agr. and Hort. Ann. Rpt., 8 (1916), pp. 11–57, pls. 3, figs. 17*).—The first part of this report (pp. 11–30) deals with inspection work, the alfalfa weevil protective service, insect control and eradication, etc. Part 2 (pp. 31–50) consists of notes on the more important insects of the year, and part 3 (pp. 51–57) takes up three plant diseases in 1916, namely, citrus gummosis, citrus scaly bark, and pear blight.

The more important insects of the year are considered under the headings of pests of deciduous fruits, small fruits, and vines; citrus and olive pests; pests of field and forage crops; vegetable crop pests; and cotton pests. During the year four species of insects and one species of red spider, not previously

...ported as of economic importance, became injurious to crops in Arizona. ...ese consist of a nitidulid beetle (*Conotelus mexicanus*) destructive to fruit ...ms, a variety of false chinch bug (*Nysius minutus*) destructive to flaxseed, ...cotton stainer (*Dysdercus albidiventris*) injurious to cotton bolls, and a red ...(*Tetranychus modestus*) injurious to corn. Aside from these, the most ...worthy insect records of the year consist of that of a cornstalk borer, ...ught to be the larger cornstalk borer (*Diatræa zeacolella*), and that of an ...rently new moth borer of pear trees.

Annual report of the State entomologist for 1915, E. L. Worsham (*Ga. ... Ent. Bul. 45 (1916), pp. 31, pl. 1, figs. 3*).—This reports upon the occurrence ... the more important insects of the year in Georgia, particularly the boll ...vil, and includes an account by I. W. Williams of cotton breeding work, ... truck crop pests and miscellaneous insects affecting shade trees and ...amental plants, a report by C. S. Spooner on pecan pests, etc. A map ...ing the area in Georgia infested by the boll weevil in 1915 and the quar...ed area in 1916 is attached.

Report of the division of entomology for the biennial period ending December 31, 1916, E. M. Ehrhorn ([*Bien.*] *Rpt. Bd. Comrs. Agr. and For... Hawaii. 1915–16, pp. 79–109, pl. 1*).—This, the usual biennial report on ...spection and other work of the year (E. S. R., 34, p. 59), includes a classified ...t of the insects collected. A report by D. T. Fullaway on beneficial insects ...p. 105–109) deals briefly with the parasites of the melon fly, corn leaf-...g..., fruit fly, mealy bug, and horn fly, and gives a tabulated list showing ...liberation of beneficial insects in 1915–16.

Report of the economic biologist, G. E. Bodkin (*Rpt. Dept. Sci. and Agr. ... Guiana, 1915, App. 3, pp. 10*).—The author reports upon the occurrence ... and work with the more important insect pests of the year in British ...iana.

Observations on some insects attacking rice, F. Supino (*R. Ist. Lombardo Sci. e Lett. Rend., 2. ser., 49 (1916), No. 2–3, pp. 108–114*).—Three aquatic in...ts that are of importance in rice fields near Milan are reported upon by the ...or, namely, *Stratiomys chamæleon*, *Trianodes bicolor*, and *Hydrocampa ...(Acentropus) nymphæata*.

Wild vegetation as a source of curly-top infection of sugar beets, P. A. ...ET and C. F. Stahl (*Jour. Econ. Ent., 10 (1917), No. 4, pp. 392–397, pls. ...*).—*Malva rotundifolia*, a common weed in sugar beet fields, has proved to be at least a symbiotic host of the virulent factor of curly-top of sugar beets. ...leaf hoppers, which were known to be nonvirulent when placed on sickly-...ed mallow plants in the field and subsequently on healthy beets, produced ...top in four experiments. "Insects known to be virulent were placed ... healthy seedlings of *M. rotundifolia*. After a certain lapse of time they ...re removed and replaced with nonvirulent insects which were later trans...ed to healthy beets. All transfers brought about the disorder."

Meadow and pasture insects.—Practical methods of control for the more ...mmon forms, H. Osborn (*Mo. Bul. Ohio Sta., 2 (1917), No. 8, pp. 268–278*).—A brief discussion of meadow and pasture insects and means for their control. The difficulties to be met with in their control are pointed out and emphasis ...d upon the importance of crop rotation. The control measures applicable ...r permanent pastures and meadows consist of burning, hopperdozers or hopper ...boxes, batting, and trap lights. Brief reference is made to their natural ...emies.

Insects that factor in the grading of apples, P. J. Parrott (*West. N. Y. ... Soc. Proc., 62 (1917), pp. 72–81, figs. 2; Rochester, N. Y.: Davis and Jeens Printing Co., 1917, pp. 10, figs. 2*).—An address, delivered before the Western

New York Horticultural Society on January 24, 1917, in which it is shown that the codling moth was by far the most important of the insects responsible for apple deformation during 1916, having been responsible for 58½ per cent. It is followed in importance by aphids, 12⅝ per cent; red bugs, 9⅛; curculio, 4⅛; lesser apple worm, 4⅛; leaf roller, 3⅛; green fruit worm, 1⅛; San José scale, 1; case bearers, ⅝; bud moth, ½; Palmer worm, ½; apple maggot, ½; and other insects, 1.

Spraying for insects affecting apple orchards in Nova Scotia, G. E. SANDERS and W. H. BRITTAIN (*Canada Dept. Agr., Ent. Branch Circ. 8 (1916), pp. 11, pl. 1*).—This circular contains the results of spraying experiments carried on in Nova Scotia during the last two years, together with notes on the control of certain insects affecting apples and pears that are prevalent at the present time. A spray calendar, revised to include the results of later work, is also included.

Insects injuring stored food products in Connecticut, W. E. BRITTON (*Connecticut State Sta. Bul. 195 (1917), pp. 3–21, figs. 18*).—A brief summary of information on stored food products insect pests, to which is added information on control measures.

The carriage of disease by insects, L. O. HOWARD (*Jour. Wash. Acad. Sci., 7 (1917), No. 8, pp. 217–222*).—This is an abridgment of the presidential address delivered before the Washington Academy of Sciences on February 1, 1917.

A key for the identification of animal parasites found in the human feces, H. G. MARTIN and L. S. MCKITTRICK (*Bul. Univ. Wis., No. 828 (1917), pp. 24, figs. 43*).—An illustrated key.

Volatility of organic compounds as an index of the toxicity of their vapors to insects, W. MOORE (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 7, pp. 365–371, figs. 7*).—This is a report of investigations carried on at the Minnesota Experiment Station in continuation of those previously noted (E. S. R., 37, p. 559). By applying the chemicals to a strip of filter paper suspended in a flask the actual amount necessary to kill the housefly in 30 minutes was determined for a large number of chemicals, the results of which are here recorded.

"In general the toxicity of a volatile organic compound is correlated closely with its volatility. A decreasing volatility is accompanied by an increased toxicity. The boiling point of the chemical is a general index of its volatility. Compounds with boiling points of 225 to 250° C. are usually so slightly volatile that they do not produce death except after very long exposures. The structure of the respiratory system of the insect is probably responsible for the remarkable influence of volatility on the toxicity of the vapor of volatile organic compounds."

Lead arsenates, stone fruits, and the weather, G. P. GRAY (*Jour. Econ. Ent. 10 (1917), No. 4, pp. 385–392, pl. 1*).—Investigations of injury to stone fruits in California during April, 1915, have shown that the acid type of lead arsenate, often labeled "standard," is unsafe to use on the foliage of these fruits except under favorable weather conditions. Pome fruits sprayed under the same conditions for the control of cankerworm showed no injury. The foliage injury in the orchards of the Santa Clara Valley in the spring of 1915 was due to the decomposition of acid lead arsenate by the weather. The basic type of lead arsenate usually labeled "triplumbic" or "neutral," which is a slower acting poison, is a safer arsenical to use on stone fruits.

Locust control in various countries, G. TRINCHIERI (*La Lutte Contre les Sauterelles dans les Divers Pays. Rome: Inst. Internat. Agr., 1916. pp. XVI+187; rev. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, pp. 100, 101*).—In an introduction by Saulnier (pp. IV-XVI) the circumstances relating to the compila-

tion of this report by the author from information collected by means of a questionnaire circularized throughout the world are described.

The report considers the history and geographical distribution of locusts; gives a list of 142 injurious species observed in different countries and the locality in which each occurs, together with their food plants; and discusses the biology and habits of locusts and control organization in each country. The methods of control are discussed under the headings of natural enemies and mechanical, physical, and chemical methods. The work concludes with a discussion of an international understanding on the question of control, the following countries being reported as approving the principles of such an agreement: Portugal, Spain, Italy, Austria-Hungary, Roumania, Greece, China, India, Morocco, Tunis, Kamerun, Canada, the United States, Mexico, and Trinidad.

A 24-page bibliography is included.

Report on control work with the locust in Uruguay, R. SUNDBERG ET AL. (*Defensa Agr. [Uruguay] Mem., 1916, pp. 444, pls. 51*).—This report presents the details relating to work in Uruguay during 1915–16 and includes numerous large-sized colored maps showing the dissemination of and control work with the locust.

Experiments in locust control by means of Coccobacillus acridiorum in Argentina. R. KRAUS (*Centbl. Bakt. [etc.], 2. Abt., 45 (1916), No. 18–25, pp. 524–539; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 9, pp. 1383, 1384*).—This paper is based upon investigations conducted by the author, as a member of a commission appointed by the Minister of Agriculture of Argentina, with a view to repeating the experiments of d'Herelle.

Organisms, morphologically identical with *C. acridiorum*, were isolated from the intestines of healthy locusts. The author was able to increase the virulence of the coccobacillus of d'Herelle and also found that the same effect can be obtained equally well with the micro-organisms from the intestines of locusts, although only negative results followed the feeding of locusts upon such organisms. His conclusions are as follows:

"It is not possible to produce in the open field the epidemic infection and the death of young locusts by spraying with a culture of coccobacillus, the virulence of which has been increased by successive passages. It may thus be concluded that this coccobacillus is a normal inhabitant of the intestine of healthy locusts and that it only kills the latter when injected into the abdominal cavity. By administering this bacterium to young locusts with food, no infection is obtained."

Summary of locust work for the third quarter, 1916, F. W. SOUTH (*Agr. Bul. Fed. Malay States, 5 (1916), No. 3, pp. 64–72*).—This is a report of work carried on in the Federated Malay States.

A new Sericothrips from Africa, J. D. HOOD (*Bul. Brooklyn Ent. Soc., 12 (1917), No. 2, pp. 32–34*).

A new species of Corythuca from the Northwest, E. H. GIBSON (*Ent. News, 28 (1917), No. 6, p. 258*).—*Corythuca pura*, collected from the prairie sunflower (*Balsamorhiza sagittata*) in several localities in the northwestern United States, is described as new.

The tomato and laurel psyllids, E. O. ESSIG (*Jour. Econ. Ent., 10 (1917), No. 4, pp. 433–444, pl. 1, figs. 2*).—Studies of 2 of the 50 species described from California, namely, the tomato psyllid (*Paratrioza cockerelli*) and the laurel psyllid (*Trioza alacris*), have been made by the author and are here reported upon.

The pink and green potato plant louse.—A new pest for Ohio causing serious losses this year, J. S. HOUSER (*Mo. Bul. Ohio Sta., 2 (1917), No. 8, pp.*

261–267, figs. 6).—A summary of information on *Macrosiphum solanifolii* [illegible] first destructive outbreak of which in Ohio took place during 1917 and [illegible] outbreaks occurred in Illinois and Missouri. In the vicinity of Cincinnati [illegible] attack, which started about the first of June, was so severe that within a [illegible] weeks entire fields were brown and dead. It was first observed to attack early potatoes and later spread to include early tomatoes and a rather wide range of host plants. Where potatoes were badly infested the vines were completely killed, while lighter infestations resulted in curling and distortion of the [illegible] which stunted the plants and materially decreased the yield of tubers. On tomatoes the leaves were affected, but the main injury was to the blossoms [illegible] where the plant lice collected in enormous numbers, causing the blossoms to fall so that no tomatoes set. In one tomato field an expected return of about $900 an acre was reduced to not more than $100 an acre.

In control work in the Cincinnati district the most satisfactory material was nicotin sulphate used at the rate of 1 to 2 teaspoonfuls to 1 gal. of water, or a half pint to 50 gal. of water, with enough soap added to form suds. While desired nicotin sulphate may be used in combination with lead arsenate or Bordeaux mixture, or in a mixture of both, but when combined with either [illegible] both soap should not be used. Several applications should be made, preferably every other day for perhaps four or five times, depending upon the weather, in order to insure the destruction of the plant lice. The importance of directing the spray upward to reach the plant lice on the underside of the leaves is emphasized.

Some sensory structures in the Aphididæ, A. C. Baker (*Canad. Ent.*, [illegible] (*1917*), *No. 11, pp. 378–384, figs. 4*8).

Eastern aphids, new or little known, I, Edith M. Patch (*Jour. Econ. Ent.*, [illegible] *10 (1917), No. 4, pp. 416–420, fig. 1*).—This paper, based largely on a collection of Connecticut plant lice, includes descriptions of *Aphis viburniphila* n. sp., from several species of Viburnum, *A. rumexicolens* n. sp., from *Rumex acetosella*, and *Prociphilus approximatus* n. sp., from white ash.

Eastern aphids, new or little known, II, A. C. Baker (*Jour. Econ. Ent.*, [illegible] (*1917*), *No. 4, pp. 420–433, fig. 1*).—This second paper includes keys to the American species of several genera, namely, Myzocallis, Monellia, Euceraphis, Chaitophorus, and Pterocomma. Five species are described as new to science.

The Aphididæ of Java, P. van der Goot (*Inst. Sci. Buitenzorg, Contr. Faune Indes Néerland., 1 (1917), No. 3, pp. 1–301, figs. 52*).—This summary of the knowledge of plant lice in Java includes descriptions of 2 new tribes, 14 new genera, and 54 species new to science. An index to the species of plant lice thus far known to occur in Java, namely, 82 species representing 34 genera, and a host plant index of the same are included, as is a list of 21 references to literature.

[Studies of pediculi] (*Parasitology, 9 (1917), No. 2, pp. 228–265, 298–324, 2 figs. 16*).—Several papers relating to pediculi, here presented, include A Contribution to the Bionomics of *Pediculus humanus* (*vestimenti*) and *P. capitis*, by A. Bacot (pp. 228–258), consisting of a detailed report of life history studies given to a large extent in tabular form; Notes on the Biology of *P. humanus*, by E. Hindle (pp. 259–265); and Studies on Pediculus.—I, The Copulatory Apparatus and the Process of Copulation in *P. humanus*, by G. H. F. Nuttall (pp. 298–324).

The louse problem, A. W. Bacot (*Brit. Med. Jour., No. 2931 (1917), pp. 296, 297*).—The data here presented are based upon the studies above noted.

The isolation of the Bacillus typhi-exanthematici from the body louse, P. K. Olitsky, B. S. Denzer, and C. E. Hush (*Jour. Amer. Med. Assoc., 69 (1917), No. 16, pp. 1165–1168*).—"Since 1910 many observers in different parts

of the world have reported the finding of an organism in typhus-infected lice. This organism they believe to have a causal relationship to typhus fever, owing to the fact that improper methods have been used, culture of this organism was impossible. In Mexico we have been able to grow this bacterium and to show that morphologically, culturally, and serologically it is identical with *B. typhi-exanthematici*."

The lesser corn stalk borer, P. LUGINBILL and G. G. AINSLIE (*U. S. Dept. Agr. Bul. 539 (1917), pp. 27, pls. 3, figs. 6*).—This is a report of studies conducted by the senior author at Columbia, S. C., during the seasons 1913, 1914, and 1915, and by the junior author at Lakeland, Fla., during 1913 and 1914.

The phycitid moth *Elasmopalpus lignosellus*, which has heretofore occurred in injurious abundance only in sporadic outbreaks, has now become of considerable economic importance in the Southern States. While particularly important as an enemy of corn, cowpeas, sorghum, and beans, it also attacks chufa (*Cyperus esculentus*), crab grass (*Elcusine indica*), Japanese cane, Johnson grass, milo maize, peanuts, sugar cane, turnips, and wheat. Though the larvæ are omnivorous, the investigations show that they have a decided fondness for Gramineæ, and probably would confine themselves almost exclusively to plants of this family if they were always obtainable. Crops grown on sandy soils or soils lacking humus are usually the most seriously affected.

The injury is caused by the larvæ boring into the stems of growing plants and feeding therein, such injury being particularly characteristic in young corn and sorghum, where the larvæ tunnel into the stalks at or slightly below the surface of the ground, through and sometimes up the heart for a distance varying from 1 to 2 in. The bud leaves of the affected plants are severed from the main plant, injury to corn in this manner resembling closely the work of the southern corn root worm (*Diabrotica 12-punctata*), but *E. lignosellus* is an upland species, found only in the driest of soils, while the corn root worm breeds generally in the moist lowlands. While some of the injured plants may survive, they remain dwarfed or become deformed. In older corn, sorghum, and cowpeas the damage consists primarily in the girdling of the stems at or slightly below the surface of the ground, and the larvæ also tunnel into the stems, thereby weakening them to such an extent that very little pressure is required to break them off. Cowpea plants have been found almost completely cut in two at a point near or slightly below the surface of the ground by the larvæ girdling the stem, while in other cases the larvæ were found tunneling into the stems as in the case of corn and sorghum. The larvæ in all stages spin a silken thread wherever they go, and the younger ones readily suspend themselves by it.

Originally described by Zeller in 1848 from Brazil, Uruguay, Colombia, and "Carolina," U. S. A., this moth is now known to occur in the United States throughout all the Southern States, westward, including the southern parts of New Mexico, Arizona, and California, and northward, including Oklahoma, eastern Kansas, southeastern Nebraska, southern Iowa, Illinois, Indiana, and Ohio, southeastern Pennsylvania, New Jersey, and along the Atlantic coast into Massachusetts.

Technical descriptions are given of its several stages, which include six larval instars. Oviposition apparently does not take place when the temperature falls much below 80° F. The eggs, which are thought to be deposited on the stems of plants, in the axils of the leaves, or on the ground at or near the bases of the stalks, hatch in 3 days in summer, 5 days in early fall, and in from 6 to 8 days in late fall. The number deposited under laboratory conditions varied from 91 to 342, with an average of 190, as many as 73 eggs being deposited in a single day. The larvæ may reach maturity in 13.8 days, but generally in about 16.8+ days during the summer months and from 22+ to

41.6 days in the fall. The number of instars and their length is quite variable, the larvæ molting four or five times in summer and five or six times in the fall. The length of the pupal stage varies from 7 to 11 days in July, 7 to 10 days in August, 8 to 18 days in September and October, and from 9 to 21 days in October and November. The longevity of the adults in rearing cages averaged 12.7 days for the summer months.

There are thought to be four generations of this species at Columbia, S. C., three complete generations having been reared from the middle of June to the middle of October in 1913. In the latitude of Columbia the first part of the winter is apparently passed as a larva and the latter part as a pupa or possibly adult, the larvæ having been found in the field in their burrows in the stalks as late as the middle of November. In Arizona it is thought to pass the winter in the larval stage, since larvæ in all sizes were found at Tempe as late as November 3.

The species apparently suffers very little from natural enemies, a single parasite (*Neopristomerus* sp.) having been reared at Columbia, S. C., and *Orgilus lævivcntris* at Gainesville, Fla.

Much can be accomplished in the control of this pest through late fall and early winter plowing after the removal or destruction of all remnants and waste material in the field, harrowing of the borders and terraces to break up the winter quarters of pupæ, the use of fertilizer to stimulate plant growth and make the plants more resistant to attacks by the pest, and the early planting of corn, sorghum, and allied crops to give the plants in the infested area a good start before the insect begins its depredations.

An annotated bibliography of 27 titles is included.

Control of the grape-berry moth in the Erie-Chautauqua grape belt. By ISELY (*U. S. Dept. Agr. Bul. 550. (1917), pp. 42, pls. 6, figs. 9*).—This bulletin, which relates particularly to control measures, is prefaced by a brief account of the economic status and a summary of seasonal history and habits of *Polychrosis viteana*, based upon observations by the author and his associates at North East, Pa., during the seasons of 1914, 1915, and 1916, and the work of Johnson and Hammar, previously noted (E. S. R., 28, p. 453).

The work has shown that the pest can be controlled by spraying, and that while other methods will reduce berry-moth infestation and some of them may be employed profitably to increase the efficiency of spraying, none offers a dependable control in commercial vineyards. The spray mixture recommended consists of arsenate of lead paste 3 lbs. or powder 1.5 lbs. and resin fish-oil soap 1 lb. in Bordeaux mixture (3:3:50). In case of extremely heavy infestation the amount of arsenate of lead should be increased to 5 lbs. paste or 3 lbs. powder, at least in the last application. The spray should be applied with "trailers," the first application immediately after falling of the grape blossoms and the second application (about two weeks later) when the grape berries are just touching. The cost of spraying material and labor required to control the grape-berry moth, if applied to control the berry moth alone, is about $5 per acre, it being assumed that an average of 6 acres are sprayed per day and that 150 gal. of liquid are applied to the acre.

"The applications of spray materials required for the control of the grape berry moth are so timed that they may be combined with applications to control the grape rootworm, grape leafhopper, and powdery mildew, and some of the applications for downy mildew and black rot also may be combined with them. Nothing need be added to the spray solution for rootworm control; nicotin sulphate (40 per cent) at the rate of 1:1,600 should be added to the second application for leafhopper control; and Bordeaux mixture should be used in both applications for fungus diseases."

The other control measures considered include destruction of leaves in the fall, bagging grape clusters, hand picking infested berries, early harvesting, destroying hibernating pupæ, etc.

A report of studies of this pest in Ohio by Goodwin has been previously noted (E. S. R., 35, p. 358).

On the pathogenicity of the so-called Sotto bacillus of silkworms, K. AOKI and Y. CHIGASAKI (*Bul. Imp. Sericult. Expt. Sta. Japan, 1 (1916), No. 1, pp.* [illegible]).—The investigations show that the fatal action of old agar cultures of *Bacillus sotto* is due to a toxin which occurs in the spores.

The atoxogen type of Bacillus sotto, A. AOKI and Y. CHIGASAKI (*Bul. Imp. Sericult. Expt. Sta. Japan, 1 (1916), No. 1, pp. 141–149*).—A strain of *B. sotto* discovered by the authors—the atoxogen type—did not produce a fatal toxin when grown in agar culture, but did, however, possess the power to produce a septicemia. It was found that the so-called atoxogen and toxogen strains can not be distinguished neither culturally or through immunization.

Flight of mosquitoes.—Studies on the distance of flight of Anopheles quadrimaculatus, J. A. A. LEPRINCE and T. H. D. GRIFFITTS (*Pub. Health Rpts. U. S., 32 (1917), No. 18, pp. 656–659, figs. 3*).—"Observations on the flight of *A. quadrimaculatus* in nature showed the flight to extend to approximately a mile from a breeding place producing very profusely. Beyond this distance stained specimens were not found. The distance of flight from a place producing very freely but less profusely than the above was decidedly less, approximately a half mile. Stained specimens of *A. quadrimaculatus* were taken as follows: One at 5,565 ft. from the point of liberation, two at 3,245 ft., three at 3,090 ft., one at 2,800 ft. *A. quadrimaculatus*, in one test, flew across a river 800 ft. wide returning to a plantation from which they were originally caught for the test. Approximately 900 or 1,000 mosquitoes were liberated."

Notes on the early stages of Chrysops, W. MARCHAND (*Jour. N. Y. Ent. Soc., 25 (1917), No. 3, pp. 149–163, pls. 3*).—A contribution from the department of animal pathology of the Rockefeller Institute for Medical Research, Princeton, N. J., consisting of notes on the egg-laying habits and the earlier stages of Tabanidæ or horseflies of the genus Chrysops. Twelve of the 34 species occurring in New Jersey were found at Princeton.

Sarcophaga hæmorrhoidalis larvæ as parasites of the human intestine, L. HASSMAN (*Ent. News, 28 (1917), No. 8, pp. 343–346*).—This reports cases of parasitism by *S. hæmorrhoidalis* in Missouri.

Fly investigation reports, I–III, WINIFRED H. SAUNDERS (*Proc. Zool. Soc. London, No. 3 (1916), pp. 461–463, 465–468, 469–479; abs. in Rev. Appl. Ent., Ser. B, 4 (1916), No. 11, pp. 167, 168*).—The first part of this report relates to some observations on the life history of the blowfly and of the house fly, made from August to September, 1915; the second part to trials for catching, repelling, and exterminating flies in houses, made during the year 1915; and the third part to investigations with stable manure to check the breeding of house flies made during the year 1915.

As reported in the third paper, the author has found two very successful methods of treating stable manure for the destruction of flies, the first consisting in a surface dressing of the manure with green tar oil or with neutral blast furnace oil and soil at the rate of 1 part of oil to 40 parts of soil, and the second, the application of tetrachlorethane in the miscible form at the rate of 2 oz. to 10 cu. ft. of manure. Both treatments killed the maggots successfully and are harmless to plants. Tar oil has a permanent effect in being resistant to rain while the effect of the tetrachlorethane lasts only while the liquid vaporizes.

Flies and typhoid, W. NICOLL (*Jour. Hyg. [Cambridge], 15 (1917), No. [illegible], pp. 505–526*).—"The chain of evidence incriminating the house fly as a disseminator of typhoid fever is at present fairly complete, but many of the links are weak and not thoroughly strengthened by experimentation. The bulk of experimental work has hitherto been done under highly unnatural and artificial circumstances and the results so obtained can not be accepted unreservedly as giving a correct view of conditions in nature.

"The experiments described in the present paper show that flies can carry typhoid bacilli from natural matter, i. e., human feces and urine, and infect them for a certain period of time. There is no evidence to show that the typhoid bacilli multiply in the house fly. On the contrary the evidence goes to show that they are not adapted for prolonged life on or in the fly. It thus follows that the house fly is a purely mechanical carrier of the typhoid bacillus and is not a natural 'host' in the strict sense of the term.

"Many bacilli closely resembling *Bacillus typhosus* in cultural characters appear to be natural or, at least, common inhabitants of the intestine of the house fly. These are extremely likely to be mistaken for *B. typhosus* unless the most stringent tests are employed. As might be expected there is evidence to show that a process of bacterial selection occurs in the fly's intestine. Some bacteria appear to flourish, but others are rapidly eliminated. Among the latter must be numbered *B. typhosus*."

Relation of the common root maggot (Pegomyia fusciceps) to certain crops in Louisiana, E. S. TUCKER (*Jour. Econ. Ent., 10 (1917), No. 4, pp. 406*).—The author reports upon injury in Louisiana to young tomato plants, garden peas, seed potatoes, young corn, and onions, and infestation of cotton seed used for fertilizer, by this root maggot.

A buprestid household insect (Chrysophana placida), H. E. BURKE (*Jour. Econ. Ent., 10 (1917), No. 4, pp. 406, 407*).—The author records the injury to window casings and door frames of sugar pine. (*Pinus lambertiana*) by a buprestid at Placerville, Cal.

The life history of Diapus furtivus, C. F. C. BEESON (*Indian Forest Rec., 6 (1917), No. 1, pp. 29, pls. 2*).—This paper reports upon studies of the life history and economic importance of *D. furtivus*, a species of shot-hole borer which attained notoriety in connection with the death of sal trees in Bengal. This borer is able to kill off trees with diseased roots, but its attack is not fatal to trees weakened by defoliation, creepers, unsuitable local conditions, etc. It normally breeds in newly dead or felled trees and is particularly abundant in felling areas and depots, being active throughout the year.

Its chief economic importance lies in the damage to unbarked timber, which takes the form of shot holes and lines and stained wood defects. It may be controlled by early barking on felling areas and the removal of newly felled trees in other parts of the forest.

The weather and honey production, L. A. KENOYER (*Iowa Sta. Bul. [illegible] (1917), pp. 15–26, fig. 1*).—The author here reports studies, based on [illegible] records for 29 years, kept by a successful beekeeper, as to the weight of a hive of bees and the accompanying weather conditions. These show that changes in the weather exert a marked influence on the production of honey. The conclusions drawn are as follows:

"June yields 56 per cent of the annual hive increase and July about half of the remainder. A large June increase is indicative of a good honey year. There is an evident alternation between good and poor years. A good year has a rainfall slightly above the average, the honey season being preceded by an autumn, winter, and spring with more than the average precipitation. A

May scarcely fails to precede a good honey season. South wind seems favorable and east wind unfavorable.

The yield shows a gradual depression preceding and a gradual increase about the fourth day following a rainy day, after which it remains fairly constant until about the fourteenth day following the rain. Good honey months average slightly higher in temperature than poor, this being especially true of the spring and fall months. Clear days are favorable to production of honey. Yield is best on days having a maximum of 80 to 90° F. and a wide daily range of temperature is favorable for a good yield. A low barometer is also favorable for good yield. The fluctuations in yield for a producing day seem to be closely correlated with the temperature range and the barometric pressure, acting jointly. A cold winter has no detrimental effect on the yield of the succeeding season, but a cold March reduces it. A winter of heavy snowfall is in the great majority of cases followed by a larger honey yield.

Seventh annual report of the State inspector of apiaries for the year 1916, C. N. GATES (*Mass. Bd. Agr., Apiary Insp. Bul. 11 (1917), pp. 26*).—This, the seventh annual report (E. S. R., 35, p. 662), is devoted particularly to a discussion of the occurrence of bee diseases in the State, the effect of repellent sprays, etc.

The domestication of the Indian honeybee, L. V. NEWTON (*Agr. Jour. India, 12 (1917), No. 1, pp. 44–57, pls. 5*).—This paper relates particularly to *Apis indica*.

Life history and habits of Polistes metricus, F. C. PELLETT (*Proc. Iowa Acad. Sci., 23 (1916), pp. 275–284, figs. 2*).—A report of observations made in Iowa.

Further observations upon the habits of the western wheat stem sawfly in Manitoba and Saskatchewan, N. CRIDDLE (*Agr. Gaz. Canada, 4 (1917), No. 2, pp. 176, 177*).—The data here presented which relate to *Cephus occidentalis* are supplementary to those given in the bulletin previously noted (E. S. R., 36, p. 250).

The author finds that this sawfly is dependent largely on wild grasses, particularly those of the genus Agropyron, including *A. richardsoni*, *A. smithii*, and *A. repens*, for its perpetuation. Various species of lyme grass (*Elymus* sp.), most of which show a marked preference for deserted fields, roadsides, etc., have proved to be of greater importance as hosts of the sawfly than was thought at first to be the case. Couch grass (*A. repens*), which grows freely among the various cultivated crops, is probably a greater menace as a host of the sawfly than any of the others. As regards remedial measures, it has been found that a trap strip of rye or wheat sown between the previous season's infestation and the new crop early in the spring and plowed down about the middle of July or cut with a mower at that time may be used to considerable advantage.

An American species of the hymenopterous genus Wesmaelia of Foerster, J. R. MYERS (*Proc. U. S. Nat. Mus., 53 (1917), pp. 293, 294*).

A report on a collection of Hymenoptera (mostly from California) made by W. M. Giffard, S. A. ROHWER (*Proc. U. S. Nat. Mus., 53 (1917), pp. 233–240*).—This contains descriptions of 15 species new to science.

Australian Hymenoptera Chalcidoidea, A. A. GIRAULT (*Mem. Queensland Mus., 5 (1916), pp. 205–230; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, p. 126*).—Among the parasites here described as new are *Pterygogramma laminata* n. g. and n. sp., reared from eggs of a jassid embedded in twigs of Eucalyptus; *Alaptus immaturus* n. sp., reared from sugar-cane leaves contain-

ing leaf-hopper eggs, but not proved to be parasitic on them; *Paranagrus* ... *lis* n. g. and n. sp., reared from eggs of *Perkinsiella saccharicida*; *P.* ... n. sp., reared from the eggs of delphacid leaf-hoppers; *Polynema* ... n. sp., parasitic in eggs of *Reduviolus blackburni* in the Hawaiian ... *Anagrus frequens* n. sp., reared from eggs of delphacids; and *Paranticis* ... n. sp., reared from the seeds of grass (*Panicum* sp.).

Parasitism of the larvæ of the Mediterranean fruit fly in Hawaii ... 1916, C. E. PEMBERTON and H. F. WILLARD ([*Bien.*] *Rpt. Bd. Comrs.* ... *Forestry Hawaii, 1915–16, pp. 111–118*).—This is a general summary ... fruit-fly parasite situation in 1916.

The four parasites *Opius humilis, Diachasma tryoni, D. fullawayi*, ... *stichus giffardianus*, are said to have become established in many ... the Territory. Summaries are given of the percentage of parasitism ... flies infesting various crops, etc., in different localities. The average ... as taken from over 26,000 larvæ secured from the kamani nut (*Terminalia catappa*) was about 41 per cent. It is much higher during some weeks ... other times much lower. The average parasitism in larvæ secured from ... other fruits throughout the ripening season was somewhat less than ... cent, although coffee was an exception, as the larvæ therefrom were found ... be as a rule highly parasitized. There seems to have been very consi... fluctuation in relative abundance of at least three of the established ... fruit fly parasites. Whereas *O. humilis* spread rapidly in a few months ... liberation, it took *D. tryoni* two years to gain a foothold, but within ... months prior to the preparation of this paper it had almost entirely sup... *O. humilis*, particularly in Kona and about Honolulu.

Notes on the construction of the cocoon of Praon, C. N. AINSLIE ... *News, 28 (1917), No. 8, pp. 364–367*).

An egg parasite of the sumac flea-beetle, C. R. CROSBY and M. D. L... (*Ent. News, 28 (1917), No. 8, p. 368, fig. 1*).—A chalcidid parasite reare... the eggs of the sumac flea-beetle (*Blepharida rhois*) at Norfolk, Va., by ... Smith, is described as new under the name *Tetrastichus oviparasus*.

An aphis parasite feeding at puncture holes made by the ovipositor, ... ROCKWOOD (*Jour. Econ. Ent., 10 (1917), No. 4, p. 415*).—Observations ... feeding of *Aphelinus lapisligni* n. sp., on the juices of its host (*Aphis* ... are recorded.

Megastigmus aculeatus introduced into New Jersey from Japan, H. ... WEISS (*Jour. Econ. Ent., 10 (1917), No. 4, p. 448*).—*M. aculeatus*, a ... opteran which destroys the entire interior of seed of *Rosa multiflora*, ... to have become established in New Jersey and has also been reported ... curring at Ithaca, N. Y.

The embryonic development of Trichogramma evanescens, monembryonic egg parasite of Donacia simplex, J. B. GATENBY (*Quart. Jour. Micr. Sci. [London], n. ser., 62 (1917), No. 246, pp. 149–187, pls. 3*).—This chalcid ... posits on the egg mass of a beetle (*D. simplex*), a single parasite ... from a host egg, and is also known to parasitize eggs of dragon flies.

Contribution to the life history and habits of the spinose ear tick, Ornithodoros megnini, W. B. HERMS (*Jour. Econ. Ent., 10 (1917), No. 4, pp. 411*).—A report of observations of the biology of *O. megnini* in California ... relating to which species have been previously noted (E. S. R., 27, p. ...

Tarsonemus pallidus, a pest of geraniums, P. GARMAN (*Maryland Sta. ... 208 (1917), pp. 327–342, figs. 13*).—This is a report of studies of the ... *T. pallidus* (=*T. approximatus*), made during the course of an investigat... the cause and method of transmission of the geranium leaf spot, and to ... the author gives the name "pallid mite."

...species was first noticed in America in New York in 1898 and described ... the following year under the name *T. pallidus*. Previous to that time ... and apparently identical mite was described from cultivated verbenas ... by Garman, who attributed the spread of a "black rust" to it. In ... it is fairly common in greenhouses and a source of injury to cycla... chrysanthemums, snapdragons, fuchsias, and geraniums. The author ... the discovery of a female of a species of Tarsonemus identical with ...*dus* at College Park, Md., on linden trees, indicating that it may not be ... to greenhouses.

...injury to geraniums is sometimes severe, causing the leaves to curl, spot, ... prematurely. The injury to heavy-wooded varieties is less pro... The presence of the mite is often first recognized by the appearance ...ed spots on the underside of the leaves. Cyclamen flowers are also ...ted frequently, the flowers withering and curling in much the same ...er as the leaves. It is most severe when the plants are crowded, the ... in contact, and the humidity high. If the plants are well spaced the ... is seldom serious, and the mites disappear or are greatly reduced in ...bers in a short time.

...eggs, which are laid during the night on the underside of the leaf or in ...ected spot between the leaf and the main stem, were found to require ...3 to 7 days for incubation at a temperature of from 68 to 77° F. The ... stage of the female is divided into two periods, the first consisting of ... period lasting 1.5 to 3 days and the second a quiescent or inactive ...d lasting from 1 to 3 days. At the end of the quiescent period the insect ... and the adult mite emerges, oviposition commencing in about 2 days. ...the cycle of a single reared male required 5 days for the egg, 2 days for ...larva, 3 days for quiescent larva, and 6 days for the adult, or a total ...days. The species was found to be parthenogenetic, continuous gener... being obtained, starting with a single egg or larva confined in glass ... which lived more than five months without the appearance of the male. ...pacity to reproduce parthenogenetically is continued for at least three ...rations and probably more. In regard to the rate of reproduction the ...or concludes that with a minimum oviposition of one egg per day during ...egg-laying period and a maximum of 12 eggs per female the number of ...females should total 40 at the end of one month, provided no males ap... His method of rearing the mites consisted in the use of shallow con... provided with a small square of lens paper and a piece of geranium ... Farrant's medium proved to be the best for mounting specimens.

...tests of the effect of various insecticides on *T. pallidus* are reported in ... form. Those tested and discarded because of injury to geranium ...include lime-sulphur 1:40 and 1:50, turkey red oil 1:30, carbon disul... emulsions 0.5 to 5 per cent (with liquid soap), sodium fluorid, sodium ...oid 10 per cent solution, kerosene emulsion, and Tak-a-nap soap 1 lb. to ...gal. Injury from chromic and picric acids is slow in appearing, and it is ...ble that a thorough watering of the plants on the day following treat... will reduce injury to a negligible factor. Small tests with blackleaf 40 ...unfavorable on the whole, but it is thought probable that nicotin has ...repellent action and should prove valuable as a preventive. A stream ...water will dislodge this mite more readily than it will red spider, due to the ...ence of webs. With geraniums the use of a stream of water as a control is ...sible because the leaves do not curl sufficiently to hide the mite as is the ...with snapdragons.

The cyclamen mite, G. F. MOZNETTE (*U. S. Dept. Agr., Jour. Agr. Research*, ...(1917), No. 8, *pp. 373–390, pls. 2, figs. 6*).—This is a report of studies of the

biology of *Tarsonemus pallidus*, made in a badly infested greenhouse [illegible] Oregon Experiment Station.

This species is a very serious floral pest found as far east as Colorado and is thought to occur throughout the United States wherever cyclamen is grown. In greenhouses in Washington and Oregon in several cases growers lost their entire stock of cyclamen during 1916 and it has been reported to injure seriously chrysanthemums and snapdragons. The distortion of the leaves and the discoloration of the flowers are the most noticeable effects of its work. The work of the mite resembles a gall on the older leaves as well as on the young, developing leaves, but the older leaves are not generally attacked. The continued growth of the damaged parts results in distortion of the leaves and the plants a very dwarfed and shriveled appearance. Often the leaves are very much thickened at the points immediately surrounding the injury. When the infestation is severe, the plants appear ultimately so badly curled and distorted as to be unsalable and they do not bloom normally. This mite is supposed to be spread by the shipment of seedlings and specimen plants from one place to another.

Technical descriptions are given of its several stages. In life history studies no nymphal stage was found, the larva transforming to a quiescent stage from which the adult emerges. Oviposition took place over a long period, the eggs being found from early November until the last of March. The eggs are laid in masses in moist, dark places provided by the curling and distortion of the leaves of the cyclamen plant. The average length of the incubation period of ten eggs at a temperature of about 70° was about 11 days. The average larval period for 10 individuals for the active stage was about 7 days, the larvæ being found from November to the last of March. The length of the quiescent stage averaged 3.5 days for 10 specimens. The adults are present from November until late spring, and it is thought that they may be found in the greenhouse throughout the year. The rearing methods employed are briefly described.

In discussing remedial measures it is pointed out that owing to the mites having an extremely primitive respiratory system fumigation is an unsatisfactory measure and spraying must be resorted to. After the older plants become badly infested there is not much hope of saving them as the mites are usually concealed under the calyx and penetrate even to the inner flower parts of the buds so that it is quite impossible to reach them, and it is advisable to burn the plants and sterilize the soil. The stable nicotin extracts and the volatile nicotin extracts, as blackleaf 40, are practically identical so far as their killing properties are concerned, and used at the rate of 1:1,000 appear to be the most satisfactory means of control. The application of the nicotin sprays containing a small quantity of soap should be started when the plants are quite young and continued every 10 days until the flower buds are well developed and begin to show color.

A list of 12 references to the literature is appended.

A synopsis of the genera of beetle mites with special reference to the North American fauna, H. E. EWING (*Ann. Ent. Soc. Amer., 10 (1917), No. 2, pp. 117–132, figs. 6*).—In addition to keys to the families, subfamilies, and genera of Oribatoidea descriptions are given of 12 new genera.

On the nymph and prosopon of the tsutsugamushi, Leptotrombidium akamushi n. g. (Trombidium akamushi Brumpt), carrier of the tsutsugamushi disease, M. NAGAYO, Y. MIYAGAWA, T. MITAMURA, and A. IMAMURA (*Jour. Expt. Med., 25 (1917), No. 2, pp. 255–272, pls. 4*).—The mite here dealt with is the carrier of the tsutsugamushi or kedani disease, an acute exanthematous infectious disease which up to the present occurs only in the northern coast districts of Japan and in Formosa. The mortality from this disease, which chiefly

...ble Rocky Mountain spotted fever, varies from 20 to 50 per cent. In ... paper the authors deal at length with the morphology and biology of the ... for which they suggest the generic name Leptotrombidium. A bibliog... of 10 titles is included.

Is Trombidium holosericeum the parent of Leptus autumnalis? M. NAGAYO, ... MIYAGAWA, T. MITAMURA, and A. IMAMURA (*Jour. Expt. Med., 25 (1917), No. ... pp. 273-276, pl. 1*).—While the tsutsugamushi, *Leptotrombidium* (*Trom...*) *akamushi*, is almost identical with the European *L. autumnalis*, the ...rs' observations and study of the literature failed to convince them that ...*ericeum* is the parent of *L. autumnalis*. Regarding the host relations ...*autumnalis* the authors state that "there is perhaps no mammal, which ... within their reach, unmolested by them; they have been found on hares, ..., various kinds of mice, badgers, hedgehogs, molebat, shrew, dogs, and ... on birds, reptiles, insects, and spiders I could, however, not effect any ...tion, though on insects and spiders near relations of *L. autumnalis* ... Our tsutsugamushi attacks field mice, rabbits, guinea pigs, mon... and other mammals, but not insects."

Notes on parasitic acari, S. HIRST (*Jour. Zool. Research, 1 (1916), No. 2, pp. ... figs. 14*).—These notes relate to some species of acari parasitic on mam... and birds in Great Britain and include descriptions of two new African ... of the family Gamasidæ. Keys are given to the species of the genera ...gamasus, Dermanyssus, and Laelaps occurring in Great Britain.

The chicken mite: Its life history and habits, H. P. WOOD (*U. S. Dept. Agr. ... 553 (1917), pp. 14, pl. 1, figs. 2*).—This is a report of studies made at ..., Tex., of the main points in the life history and bionomics of *Der... gallinæ*, especially those of importance in the application of control ...

The incubation period of the eggs during the latter part of August at an ... mean temperature of 78.43° F. was about 48 hours. At an average ... temperature of 73.5° the larva molts in about 24.5 hours without ever ... fed. At an average mean temperature of 82.9° the first stage nymphs ... in somewhat less than 24 hours. With the exception of one individual ...served the second stage nymphs molted to adults in 3 days after feeding. ...tilization normally takes place off the host and usually before feeding, fol...ed by oviposition within about 12 hours after feeding. Females deposit an ...rage of 4 eggs each at the rate of 4 eggs in 24 hours and they will continue ...feed and deposit at least eight times with one fertilization.

The details presented relating to the life cycle show 10 days to have been ...nimal time taken to pass through the life cycle under favorable conditions, ... under natural conditions it is thought that the period would be reduced ... August to at least 8.5 days. A certain amount of moisture and a moderate ...perature were found to favor longevity, while extreme dryness and high ...peratures are unfavorable factors. Under favorable conditions during July, ..., September, and October, adults and second stage nymphs lived from 91 ... days. The longest period for adults which had never fed was 88 to 96 days ...ing October, November, December, and January. The longevity of the ...st stage nymphs was found to be about the same as the other stages. During ...e months of September to January, inclusive, all stages on wood lived from ... to 113 days, while stages in a glass chimney with a cracked egg lived more ...an 197 days during the same months. The conclusions drawn from these ...servations are that the mite can be starved out of a chicken house by keep... fowls and other animals away from the house for four months during ...e summer season and for 5 months during the cooler season in the latitude ... Dallas, Tex.

It was found that normal feeding takes place during the hours of d[illegible] and that the mites leave the fowl soon after feeding, all stages attac[illegible] feeding, and leaving a fowl in less than 2 hours. It is pointed out th[illegible] persion of the mites may take place by infested fowls being transferre[illegible] clean localities, by the use of boxes and crates in which infested fowls h[illegible] been kept, through being carried by man on his clothing, on sparrows p[illegible] horses, cattle, dogs, cats, and certain wild animals, such as foxes, skun[illegible] weasels, and by migration of the mites to buildings in contact or close pro[illegible] to infested premises. Since the mites prefer to hide on roosts or [illegible] thereto, the roosts should not be attached to the walls.

For control measures the author refers to Farmers' Bulletin 80[illegible] previously noted (E. S. R., 37, p. 357). The natural enemies mentioned [illegible] a small black ant (*Monomorium minimum*), the fire ant (*Solenopsis g[illegible]*) and spiders.

New mites, mostly economic, N. BANKS (*Ent. News, 28 (1917), No. [illegible], pp. 193–199, pls. 2*).

FOODS—HUMAN NUTRITION.

A comparison of several classes of American wheats and a consider[illegible] of some factors influencing quality, L. M. THOMAS (*U. S. Dept. Agr. B[illegible] (1917), pp. 1–28, figs. 21*).—From milling and baking tests undertaken [illegible] operation with the North Dakota Experiment Station with a view to pro[illegible]ing data of value in establishing a scientific basis for the classification [illegible] grading of wheat, the following conclusions were drawn:

"Normal, plump, dry, and sound wheat of all classes yields approxi[illegible] the same percentage of flour. Over 80 per cent of the samples of each of [illegible] three classes of the more common wheats, soft and hard red winter and [illegible] red spring, yielded between 67 and 75 per cent of flour.

"There is a direct relation between milling yield and the moisture [illegible] of wheat, and in a general way the yield varies inversely with the mois[illegible] content. . . .

"The weight per 1,000 kernels or average weight of kernels has very [illegible] value in judging the potential flour yield.

"Although there are frequent exceptions when individual samples are [illegible] sidered, average results show a very striking relation between wei[illegible] bushel and flour yield, the latter varying directly as the former. The [illegible] between these two figures, however, is not quite the same for the diffe[illegible] classes, nor is it the same for all varieties within each class.

"In color the bread from the flour of the various classes of common [illegible] shows about the same ranges and averages. The flour from durum wh[illegible] considerably more creamy and thus averages several points lower than [illegible] any other class. Bread from all normal durum samples has a tinting or [illegible]tion varying from slightly creamy to bright yellow, while of the hard [illegible] winter samples 77.6 per cent show a noticeable creamy tint; of the hard [illegible] spring samples, 69.5 per cent; and of the soft red winter samples [illegible] per cent.

"The general results indicate that test weight and soundness, considered [illegible]gether, are of far more value in appraising quality than any one of these [illegible] sidered by itself.

"Small amounts of inseparable material are generally accompanied by [illegible] decrease in flour yield, as would be expected, in that as a rule a large [illegible] such material usually finds its way into the bran and shorts.

"Loaf volume and texture are the two factors which are considered [illegible] indicative of strength. While a great range of strength was found within

... of wheat, the averages for each class show considerable differences be... the various classes when considered as a whole. Given in order from ... to strongest, the classes are soft white, soft red winter, durum, hard ... winter, and hard red spring wheat.

"The average loaf volume in cubic centimeters for each of these classes is ... hite wheat, 1,999; soft red winter, 1,965; durum, 2,070; hard red winter, ... and hard red spring, 2,421. In the matter of texture the several classes ... the same order, except that soft red winter has a slight advantage over ... wheat.

"Of the four more important classes of wheat under consideration, durum is ... highest in crude-protein content; hard red spring, second; hard red winter, ... and soft red winter, fourth. High crude-protein content as a rule is ... accompanied by high strength, but the relation between these two factors ... with the different classes of wheat and extremely high crude-protein con... sometimes accompanied by a decrease in baking strength.

"The average water absorption of the flour from durum and from hard red ... wheat is about the same, and that of hard red winter is only slightly ... The water absorption of the soft wheats averages from 3 to 4 per cent ... than for the hard wheats. The range of water absorption of each class ... within wide limits. There is a direct relation between the water ... tion of the flour and the bread yield of a unit quantity of the same. As ... the higher the absorption the greater the weight of the loaf."

Wheat and flour investigations, V, G. A. Olson (*Washington Sta. Bul. 114, pp. 12–86, figs. 14*).—Continuing previous work (E. S. R., 26, p. 738), ... of the three studies reported had to do with the baking quality of flour ... the third with the milling value of water-soaked wheat.

In the first study a comparison of the results of the chemical and baking ... of flours from 12 States included offer evidence for the belief that there ... relation between the quality of flour and the total nitrogen, alcohol-... protein components, gluten content, water-soluble solids, and acidity. ... were relations between the gluten content and the water retaining ... of flour observed."

"Although no conclusions could be drawn, the volumes of the loaves appeared ... inversely proportional to the gluten content. A loaf of bread having an ... specific gravity 0.25 or less may be regarded as a satisfactorily baked ...

With respect to the influence upon the baking quality of the removal from ... of water-soluble, alcohol-soluble, and salt-free extracts, and of the addi... to flour of electrolytes, the following conclusions from the data are reported:

"The irregularities noted in the nitrogen-free and ash-free extract content of ... giving the same and different volume capacities indicate that the nitrogen-... and ash-free extracts do not bear the relation to volume that would be ... according to theory.

"There is strong evidence supporting Wood's theory that the ratio of soluble ... to total nitrogen determines the shape of the loaf. Our experiments indi... that the nature of the electrolytes contained in the soluble ash may have ... to do with the property of shape, and this may account for the ... arities noted.

"The baking quality of flour was not perceptibly affected by the addition of ... acid at the rate of 0.54 gm. per 100 gm. of flour; the addition of the men... amount of acid, however, did affect the amount of gluten that could be ... from the flour. The significance of modifying the quality of the ... and its unnoticeable effect upon baking quality should not be overlooked.

"The removal of the 70 per cent alcohol extractives from flour impaired the baking qualities of the flour to the extent that it was impossible to obtain a satisfactory fermentation of the dough.

"Flour in which a part of the soluble salts had been removed through the process of dialysis also gave unsatisfactory fermentation action when compared with the same flour untreated."

The second of the studies has to do with the influence of the various components of flour upon baking quality and is a progress report. Some of the results obtained are summarized as follows:

"The water-soluble extractives from flour were added to both wheat and corn starch with beneficial results in volume production. Flour from which the gluten was removed gave similar results.

"The addition of gluten to both wheat and corn starch resulted in forming compact, rubbery masses. Flour from which the water-soluble extractives were removed also resulted in forming compact masses.

"The addition of the water-soluble extractives to flour made up of either wheat starch and gluten, or cornstarch and gluten, resulted in increased volumes, but these were not equal to the volumes obtained by mixing the water-soluble extractives with both the wheat starch and cornstarch or flour from which the gluten had been removed.

"While it is true that the significance of the water-soluble and gluten component of flour to baking quality are shown to a certain extent in our experiments it is impossible at this writing to express the exact importance of each."

The results obtained in the study of the milling value of water-soaked wheat are summarized as follows:

"Wheat which has been allowed to sprout loses in weight as the length of time allowed for germination advances. The milling value of germinated wheat decreases as the length of the plumule increases. The length of time required for the conversion of starch decreases as the length of the plumule increases to at least twice the length of the kernel.

"The amount of gluten which can be recovered from flour from germinated wheat is less than that from ungerminated wheat. The yield of gluten decreases rapidly as the plumule increases in length.

"Expressed in percentage of total nitrogen, the alcohol-soluble nitrogen has been affected by the germination of wheat. The most marked changes were observed in the glutenin and amid nitrogen. In the former there was a similar decrease in amount from the period where the plumule was equal to the length of the kernel to that where the plumule was equal to twice the length of the kernel. The amid nitrogen increased rapidly from the time when the plumule was equal to the length of the kernel.

"When germinated wheat flour was baked only the quality of the crust of the bread was impaired; this was particularly noticeable in flours made from germinated wheat in which the plumule was equal to or twice the length of the kernel. The volume of the loaf increased, being exceptionally large in the bread made from partially germinated wheat flour.

"Using small quantities of germinated wheat flour with other flour, it was found that the volume of the loaf could be increased without impairing the texture of the loaf. Each particular flour requires a different amount of germinated flour in order to produce the best results. Too large an amount of strongly diastatic flour is less beneficial than none.

"A water-soaked wheat is not necessarily spoiled and can be used for milling purposes, providing it has been thoroughly cleaned and dried."

The introduction to the bulletin summarizes historical data, which are supplemented by a bibliography.

The milling and baking data for the 1915 crop of wheat, T. SANDERSON (*North Dakota Sta. Bul. 122 (1917), pp. 61–94*).—This includes a critical discussion of wheat grading and its effect upon the economies of the wheat industry from an agricultural standpoint. It is based upon milling and baking tests conducted for a large number of wheats.

"Summing up this whole matter as to the trouble resulting from the sale of wheat it may be safely charged to the system used in grading. . . . It is evident that the majority of men engaged in the grain trade are not aware of the true milling value of the different lots of wheat coming to them and that they are conscientious in their application of the system in vogue, while it is the correct application of this system that is working such a hardship on our local miller, as well as the farmers. If the local millers were aware of the actual value of the so-called lower grades of wheat, they would use more of them in their mixture, thus reducing the cost of their raw material. At the same time they would reduce the amount of low-grade wheat going to the terminal market; thereby increasing the cost of the raw material to their competitors."

"There is some wheat in almost every crop year that should not be used for human consumption, but should be condemned and only allowed to be sold as animal food, and if not fit for that purpose, should not be allowed on the market at any price, the same as is done with meat and many other food products. Under the present system the majority of this low-grade wheat is bought by the elevator companies and mixed in small quantities and eventually finds its way into the flour of the consumer. In many instances the price paid is far above what it is actually worth for feed. Many of the complaints from the consumers coming to the miller are just and could be attributed to this cause." Similar data for other years have been noted (E. S. R., 34, p. 759; 36, p. 464).

Shrimp: Handling, transportation, and uses, E. D. CLARK, L. MACNAUGHTON, and MARY E. PENNINGTON (*U. S. Dept. Agr. Bul. 538 (1917), pp. 1–8, pls. 2*).—Handling, preparing, and shipping cooked and raw shrimps, dried shrimps, and other specialties, the utilization of shrimp waste as fertilizer, and the food value of shrimp meat are discussed in this bulletin, the data including analyses of cooked, canned, and dried shrimps.

"Cleanliness, proper cooking, and care in handling shrimp, combined with a discontinuance of the practice of using preservatives, have resulted in the production of a finely flavored product which is gradually increasing in popularity. At the same time improvements in methods of packing and preparation have made shrimp accessible to many new markets at long distances from the producing sections. . . .

"The increased consumption of shrimp and the opening of new markets are stimulating the industry to increase its catches. If shrimp are taken at the spawning time of year or in excessive numbers their extermination is probable. Those interested in the shrimp industry, therefore, should give early attention to the question of conservation. It is also to the interest of those whose livelihood is dependent upon catching and packing shrimp to encourage investigations planned to determine the periods of spawning, the times of migration, and the feeding habits of shrimp, and to do their part in helping to make such investigations result in the adoption of protective measures."

Food products and drugs, J. P. STREET (*Connecticut State Sta. Rpt. 1916, pt. 2, pp. 185–304*).—The 1,369 products here reported on include, among many others "hygienic coffees," diabetic foods, condensed and powdered milks, spices, vegetable extracts, baking powder, spices, and a proprietary article akin to meat extract made from squab.

[Food and drug inspection], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 4 (1917), No. 14, pp. 363–378*).—In addition to data re-

garding sanitary inspection and the examination of foods and beverages. formation is given on a proprietary drug preparation by C. P. Guthrie, and Stealing Bread and Butter, by R. E. Remmington, is included, the latter h to do with "a very general sale of short-weight butter" which "inspectors the food department have discovered."

How to select foods.—III, Foods rich in protein, CAROLINE L. H HELEN W. ATWATER (*U. S. Dept. Agr., Farmers' Bul. 824 (1917), pp. 2 to 2*).—In this, the third of the series (E. S. R., 37, p. 668), the proper sel of foods rich in protein is discussed in relation to the other four food gro which foods may be conveniently divided for the discussion of dietary p

"Since the protein foods include many of the more expensive foods in mon use, and since an adequate supply of protein is essential to the growth upkeep of the body, it is especially important for the housekeeper to k how much her family needs and to be able to choose the materials which particular circumstances, will best provide the proper kind and amount."

Among the generalizations made are the following: "The foods usually as rich in protein are: Milk and cheese; eggs; meat, poultry, and fish; legumes, such as peas, beans, cowpeas, soy beans, and peanuts; and also some other nuts. Wheat, oats, and some other cereals also furnish considerable amounts of protein. Milk is the best source of protein for children. T about one-fourth ounce of protein in each of the following: One glass of one egg, 1½ to 2 ounces of meat, 1 ounce of cheese, and 13 ounces of bread. man at moderate muscular work is believed to need about 3½ oz. of prote day, and a family consisting of father, mother, and three small children 12 oz. a day."

"It is possible to plan an attractive and wholesome diet in which e of the necessary protein is supplied by bread and other cereal foods which relatively cheap. The more milk, eggs, and other protein-rich foods are c bined with other foods in cooking, the less protein-rich foods are needed for as separate dishes. Skim milk is not a substitute for whole milk as a food little children, but it can be so used as a source of protein in the diet of o A quart in cooking or to drink will add as much wholesome protein to the e eral diet as a quart of whole milk. Providing they are clean and wholes sour skim milk and buttermilk may be used instead of sweet. Real economy the use of protein foods lies not in leaving them out of the diet, but in choo and combining kinds which will supply the total amount needed as cheaply circumstances permit."

ANIMAL PRODUCTION.

A quantitative comparison of casein, lactalbumin, and edestin for growth or maintenance, T. B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem. (1916), No. 1, pp. 1–23, figs. 4*).—To avoid criticisms made in the case of previous experiments when food was given ad libitum, in this case the animals were fed equal amounts of the isolated food materials. By keeping the food below the amount ordinarily consumed and varying the amount from day to day the animals were kept growing at nearly the same rate.

The results of the test show that with rats of similar initial weights and on the same amount of food in equal portions daily, the lactalbumin foods in every case gave the largest gains. These later experiments prove also what was formerly indicated, namely, that the comparative inferiority of casein may be corrected by the addition of the essential amino-acid cystin. The experiments further show that protein beyond a concentration of approximately 12.5 per cent of the total calories failed to give increase of body weight.

In a second experiment instead of giving each animal equal amounts of food daily it was increased to each individual in proportion to the gains made. T

...gain again was superior, it taking 50 per cent more of casein and nearly ... per cent more edestin to produce the same gain. With a lactalbumin food ...ining 8 per cent it took 12 per cent of casein and 15 per cent of edestin to ...uce the same gain in weight. The replacement of cystin by alanin in the ... with casein failed to bring about a nutritive advantage. In mature ani... where maintenance requirements and not growth are to be met, the results ... the different proteins are not so marked.

Further experiments were made in which the three proteins were fed daily ... such a way that no essential gain or loss in body weight occurred. The total ... intake was made sufficiently liberal, the protein only being kept at the ... The results corroborate the former conclusions as to the compara... superiority of lactalbumin when fed with the other two proteins in minimum ...ings.

The effect of the amino acid content of the diet on the growth of chickens. ... B. OSBORNE, L. B. MENDEL, ET AL. (*Jour. Biol. Chem., 26 (1916), No. 2, pp. ...300, pl. 1*).—Experiments by the authors with rats have shown the im... ...rtance of certain amino acids for growth, notably tryptophane, lysin, and ...stin. Similar work by Buckner, Nollau, and Kastle (E. S. R., 34, p. 871) with ...kens is noted. Further work was carried on with chickens, using foods ...ar to those employed with rats.

The results with chickens were found in accord with those obtained in the ...eriment with rats. Lactalbumin, rich in both tryptophane and lysin, proved ... an efficient adjunct to the proteins of corn gluten.

The productive values of some Texas feeding stuffs, G. S. FRAPS (*Texas ... Bul. 203 (1916), pp. 5–42*).—These experiments were conducted in the same ... as those previously noted (E. S. R., 27, p. 668; 31, p. 862). The coeffi... of digestibility and productive values as determined on sheep are shown ... the following table:

Average coefficients of digestibility of feeding stuffs and productive values.

Feeding stuff.	Protein.	Ether extract.	Crude fiber.	Nitrogen-free extract.	Ash.	Productive value.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Lbs.*
...chuan forage	9.1	37.1	58.2	45.6	1.4	5.3
...p, Argentine	86.3	91.3	92.4	92.9	99.4	22.4
...ge	59.2	69.4	74.7	76.3	43.8	3.8
...ed	79.5	96.3	52.5	68.1	58.4	18.1
...rabish hay	72.3	52.0	54.7	64.6	26.5	6.3
...seed	90.0	74.5	50.0	96.6	89.0	21.2
...a fodder	50.1	58.7	66.3	60.9	29.2	8.2
...n, chopped	89.6	81.6	90.2	96.8	89.6	19.6
...ver	18.2	47.6	48.6	46.3	0	5.4
...fodder	62.4	56.4	68.8	69.8	37.2	10.3
...d chop, average	75.6	86.7	91.7	90.8	30.9	18.6
...ver	0	56.6	65.8	49.2	0	6.8
...fodder	38.1	70.9	72.0	78.2	51.6	13.6
...n hay	67.1	10.8	52.3	64.9	6.3	8.3
...w, fe, average	80.8	93.3	34.4	12.8	0	22.7
...	62.2	35.9	16.4	57.6	6.8	1.5
...ay with nuts, average	75.8	92.0	47.9	68.3	37.1	15.6
...ay without nuts, average	64.0	63.8	49.6	75.5	29.6	10.7
... hay, average	0	100.0	0	0	1.6	.4
...ass hay	10.8	42.6	58.4	51.8	9.4	7.1
... ...ne, ground, average	43.8	45.3	67.9	58.0	27.9	8.2
...ay	75.6	76.1	10.4	90.6	7.7	15.9
...ver	37.8	56.0	51.3	47.6	.....	5.4
...n silage, average	0	32.3	64.7	50.4	49.2	6.7
...n fodder, average	0	54.0	58.0	64.0	4.0	2.6
...n forage	38.0	65.9	61.0	63.0	4.0	9.4
...n hay	9.1	37.1	58.2	45.6	1.4	5.3
... hay, average	38.2	62.0	62.2	63.0	28.4	8.9
... straw	49.4	54.0	61.2	52.9	24.8	7.4
...t shorts	45.9	34.5	60.0	47.7	6.8	6.8
	92.1	86.7	50.0	98.5	35.5	21.9

Live stock feeding experiments (*Dept. Agr. and Tech. Instr. Ireland J. ..., 16 (1916), No. 3, pp. 418–430*).—The report deals with experiments carried ... during two years, 1913–1915, under the supervision of agricultural instruc... in almost every county in Ireland. The following conclusions are drawn.

In pig feeding raw meal showed a saving in fuel and labor. Cooking ... to give returns either in amount of feed consumed, length of fattening ... or quality of the pork.

In calf feeding maize meal with separated milk showed practically ... results as a calf meal made up of 1 part ground flaxseed, 2 parts maize ... and 2 parts oatmeal.

With cattle the feeding of a mixture of 2 parts undecorticated cotton ... and 1 part maize meal on second-rate pasture did not give a profitable in... in live weight. Indirectly it might give a profit by earlier maturity or ... appearance at marketing.

With stall-fed cattle the extent to which turnips should be used is a ... question for each farmer to decide. In most cases it seemed sound economy ... grow them extensively and feed liberally. Cattle can be fattened successf... with 3 stone (42 lbs.) of turnips per head daily.

Almost similar results were obtained with two rations, one with 84 lbs. ... roots and a moderate amount of concentrated food, and one of 42 lbs. of ... and an extra allowance (3 lbs.) of concentrated food.

Color inheritance in mammals, S. WRIGHT (*Jour. Heredity, 8 (1917), No. ..., pp. 224–235, figs. 2*).—An attempt is here made to relate the biochemical ... ings in regard to melanin with color relations that have come to light ... genetic work. A scheme is proposed for showing the interrelations of the ... ferent mammalian coat colors, and a classification of color factors is sugge...

The value of good sires, J. K. WRIGHT (*Missouri Bd. Agr. Mo. Bul., ... (1916), No. 9, pp. 5–86, figs. 58*).—This bulletin reviews in a general way ... principles of heredity, environment, and variation, and shows by citation of ... few great herds and from experimental data from other sources the value of ... good sires in the improvement of horses, asses, cattle, sheep, and swine.

The heredity of dual-purpose cattle, H. F. EUREN (*Norwich, [England]: ... A. D. Euren, 1917, pp. 96*).—A brief history is given of the origin and dev... ment of the dual-purpose Red Polled breed of cattle, including an account ... the work of John Reeve, of Wheycurd Hall Farm, Wighton, England, ... others in the development of the breed.

For the study of the heredity of the Red Polled, as evidenced by its ... production and its beef production, the author has prepared from the Brit... and American Herd Books the extended pedigree of 29 cows in the United King... dom and of 11 in the United States. In each of the pedigrees has been worked ... out the percentage of blood of polled "home-bred" cattle of Norfolk, ... Suffolk, and the Reeve blood-red breed.

Details are given of the breeding of noteworthy bulls that have been used ... developing the Red Polled dual purpose cattle, together with data on the ... of feeding for milk and beef. Transcripts are also given from the British and ... American Herd Books showing the butter production and beef-making qualities ... of some of the leading strains and families of Red Polled cattle.

Sheep breeding and feeding, J. M. JONES (*Texas Sta. Bul. 205 (1917), pp. ... 3–24, figs. 5*).—The object of this test was to determine which of the most com... mon mutton breeds of rams when crossed with fine-wooled ewes would produce ... the most thrifty and desirable lambs grown and fattened under Texas con... ditions.

Good Rambouillet range ewes of uniform type and breeding were used, the ... ewes being divided into six lots and bred to rams as follows: Lot 1, Rambo...

[illegible] lot 2, Shropshire; lot 3, Hampshire; lot 4, Southdown; lot 5, Lincoln; and [illegible] half-blood Karakule-Lincoln. The resulting lambs numbered 120, all of [illegible] were hardy and thrifty from birth. The highest average birth weight [illegible] shown by the Hampshire-Rambouillet cross, and they also made the greatest [illegible] gain and seemed to finish in a shorter period. The cost of feed per [illegible] of gain in the experiment was, from October 13 to January 5, 3.32 cts., [illegible] from January 6 to 17, 5.03 cts.

Six of the best lambs were taken from each lot and fed from January 6 to [illegible] 8 for the National Feeders' and Breeders' Show. The cost of feed per [illegible] of gain during this period was 6.32 cts. Pens of these lambs in competition at the show were ranked as follows: Lincoln-Rambouillet, Hampshire-Rambouillet, Southdown-Rambouillet, Rambouillet, Karakule-Rambouillet, and [illegible]shire-Rambouillet.

A [illegible]oved salt trough used during the experiment, and which seemed to be [illegible] was made to apply pine tar to the lambs to keep the gadfly away from [illegible] nasal cavities. The trough, 4 in. by 6 in. by 4 ft., had a board 3½ in. wide [illegible] 3 in. from the bottom. A strip of sheepskin, with the wool side out, was [illegible]ed to the edge of this board and smeared with pine tar every evening just [illegible] bringing the sheep into the lot.

Oestrus and ovulation in swine, G. W. Corner and A. E. Amsbaugh (*Abs. in Anat. Rec., 11 (1917), No. 6, p. 345*).—The authors found that animals killed during the period of heat usually show ruptured Graafian follicles, and in such animals the ova were recovered by washing out the Fallopian tubes. Rupture of the follicle is spontaneous, occurring even in the absence of the boar. Sows killed on the third day of heat showed regularly that ovulation had taken place. The unfertilized ripe ovum of the sow, as found in the tube, measures from 155 to 167 μ in diameter. The zona pellucida is from 7 to 8 μ thick, inclosing a yolk heavily laden with fat globules, obscuring the nucleus. The polar bodies are not clearly seen in the fresh ovum. Study of a small series of ova which have been cut into serial sections seems to show no deviation from the stages described in other mammals. The first polar body is formed within the follicle just before rupture, the second in the tube. Entrance of the spermatozoön and union of the pronuclei occur in the tube.

Cost of keeping farm horses and cost of horse labor, M. R. Cooper (*U. S. Dept. Agr. Bul. 560 (1917), pp. 22, figs. 5*).—Results are given of a study of cost accounting records for 154 horses on ten farms in Illinois, 72 horses on seven farms in Ohio, and 90 horses on ten farms in New York. The purpose of the bulletin is to show how the annual cost of keeping a farm work horse and the cost per hour worked may be determined, and to point out that the cost per hour worked is the true measure of the profitableness of a horse to its owner.

The several items of cost and credit which make up the annual average cost per horse are analyzed in detail and tabulated. It was found that the annual feed cost for keeping a horse was $100.65 in Illinois, $120.37 in Ohio, and $145.02 in New York. A study of the relation of work performed to the total feed cost shows that on an average on the farms studied there was a fairly uniform difference between the average feed cost and the total cost per hour of horse labor, showing that the number of hours worked and the feed cost per horse are the controlling factors in the total cost per hour of horse labor. On the Illinois farms the horses worked an average of 1,053 hours per year at an average cost of 9.56 cts. per hour, on the Ohio farms an average of 866 hours per year at an average cost of 13.9 cts. per hour, and on the New York farms an average of 1,020 hours at an average cost of 14.22 cts. per hour.

It was found that the large farms permit of a more efficient use of horse labor than do the small farms. On the large farms in Illinois there were 22.2

acres in crops per horse, while on the small farms there were but [illegible] per horse. Similar results were found on both the Ohio and the New York farms, though in these States the difference between the two groups was not as great as in Illinois.

Some important essentials in profitable horse production, C. W. McCAMPBELL (*Kansas Sta. Insp. Circ. 2 (1916), pp. 3*).—In addition to brief [illegible] profitable horse production, a list is given of stallions licensed in Allen County during the year ended October 1, 1916. Similar lists are published for the other counties of the State, each list being issued as Inspection Circular 2.

The theory of sex as stated in terms of results of studies on the pigeon, O. RIDDLE (*Abs. in Anat. Rec., 11 (1917), No. 6, p. 310*).—Studies on sex [illegible] in pigeons have indicated the nature of the initial difference between sex [illegible] prospectively different sex-value. "This difference rests upon different [illegible] metabolism, and when the metabolic level of a given germ is shifted from [illegible] level characteristic of the germ of one sex sufficiently toward the level [illegible] other sex, it develops into an organism of the sex which corresponds to [illegible] acquired, or later, level. The initial difference characteristic of the two [illegible] of (sex) germs, tends to persist and characterize the adults of the two sexes.

"Sex is based on a quantitative difference. Intermediates of the normal extremes have been experimentally produced, and the normal extremes have themselves been experimentally accentuated."

Factors influencing the sex ratio in the domestic fowl, R. PEARL (*Science, n. ser., 46 (1917), No. 1188, p. 220*).—In this paper on the sex production question in the common fowl, results are given of eight years' experimentation at the Maine Station in which over 22,000 individuals were involved.

This work indicates first that the determination of sex in poultry is primarily a matter of a definite, hereditary mechanism, just as it is in insects and other forms which have been studied. At the same time, it is demonstrated that under certain physiological circumstances the operation of this mechanism may be modified in such a way as to lead to the production of more females in proportion to the number of males. The chief factor in bringing about the modification in the direction of a larger production of females is the fecundity or laying ability of the hens used as breeders. The larger the number of eggs which a hen lays before being put into the breeding pen, the larger will be the proportion of females and the smaller the proportion of males produced by her eggs.

Crossing over in the sex chromosome of the male fowl, H. D. GOODALE (*Science, n. ser., 46 (1917), No. 1188, p. 215*).—In studying sex linkage in fowls, crossing over in the sex chromosomes of the male was seen to have occurred. This preliminary report deals only with the factors themselves, without regard to the somatic appearances of the individuals. "Three dominant sex-linked characters, namely, B, I, and S, were employed. B and I were introduced on one side, S on the other. Hence the F_1 males were all BI. S; B and I being in paternal (or maternal) sex chromosome, S in the maternal (or paternal). These males have been tested by mating them back to females of the composition b Is, b is.

"If there were no crossing over, offspring of this back cross showing the combination of somatic characters found in the F_1 male would not occur. Actually, however, they do occur, thus demonstrating that crossing over has occurred, a chromosome having the composition B I S having been formed. Other cross-over classes have appeared, but the one cited is the one at the present age of the chicks most easily recognized."

Further data on the relation between the gonads and the soma of some domestic birds, H. D. GOODALE (*Abs. in Anat. Rec., 11 (1917), No. 6, pp. 313–314*).—Published data on the ablation of the testes and ovaries of domestic

... together with unpublished data on the transplantation of the ovary into ... males, tend to show that different parts of the soma react in different ... to the secretion of the gonads. Each character appears to be more or less ... of every other character, just as they are in heredity. The characters affected are (1) those including some of the secondary sexual characters ... are independent of either ovary or testis, such as size in the female, voice ... some phases of behavior, and mandible color in ducks; (2) those affected ... testis, such as comb and wattles, fat deposition, size in the male, and ... instincts and summer plumage in ducks; and (3) those that are affected ... ovary, such as plumage form and color and some phases of behavior.

"If the entire series of altered individuals is examined, it is apparent that ... may be looked upon as a series of sex intergrades. That is, characters that ... usually found in one sex may be experimentally transferred to the opposite ... while individuals composed of mixtures of such characters may be ob...."

Determinate and indeterminate laying cycles in birds. L. J. Cole (*Abs. in Anat. Rec., 11 (1917), No. 6, pp. 504, 505*).—The author has noted two distinct types of laying cycles in birds, one in which the number of eggs which will be ... in the clutch is definitely determined when laying begins, and the other in ... the number of eggs that will be laid depends upon stimuli received after ... has begun. In other words, the stimulus for cessation of laying and ... of brooding has already been received and the reaction predetermined in the first case, while in the second the stimulus is received later and ... followed by cessation of liberation of ova from the ovary, though laying continues for a time afterwards until the ova already discharged have received ... and shells and have been expelled. The most important stimulus for ... of broodiness and the consequent cessation of laying in the second ... of cases is probably a physiological reaction of the female to a number ... in the nest. As a consequence, if the eggs are removed as laid the ... does not occur and laying continues beyond the regular clutch to an ... number.

Among domesticated birds the pigeon may be taken as an example of the ... type and the common fowl of the indeterminate. Among wild ... experiments have been carried on with the English sparrow and the house ..., which also appear to represent the two types respectively.

A study of broodiness in the Rhode Island Red breed of domestic fowl. J. D. Goodale (*Abs. in Anat. Rec., 11 (1917), No. 6, pp. 533, 534*).—In addition to results already noted (E. S. R., 36, p. 173), the author points out that the ... of the period before the first broody period appears in Rhode Island ... hens may vary from a month up to two or even more years, while a very ... percentage have never exhibited signs of broodiness. Ninety-five per ..., however, of the birds go broody before July 1 of their pullet year. The ... of broody periods depends in part on the date of the first broody period ... in part on the time the bird stops laying in the fall, and may vary from one ... eleven times during the first year. In the second year broody periods begin ... as the bird lays a comparatively few eggs.

Breeding for egg production.—II, Seasonal distribution of egg production. ... D. Ball and B. Alder (*Utah Sta. Bul. 149 (1917), pp. 3–71, figs. 29*).—In ... continuation of previous data (E. S. R., 37, p. 369), this is a discussion of the ... distribution of egg production during the first, second, third, and ... years of egg laying of the same flocks of hens, and a comparison of the ... production of high-laying and low-laying flocks in the same season ... different seasons, as well as of high-laying and low-laying individuals

of the same flocks. These studies are based on six flocks of White Leg... hens ranging from nine to three years old and all descendants of a ... flock.

The authors conclude that "environmental factors influence the re... the pullet year more than that of later years and influence flocks making records more than those making high ones. Flocks of Leghorns with appr... mately the same yearly laying records will show the same distribution th... out the season regardless of whether the records were made in the first, s... or third year of production. Where a flock makes a low record the curve ... distribution will be lower throughout than that of a high-laying flock ... except for environmental fluctuations, the two curves will be practically p...

"Where the high and low layers of the same flock are compared, the ... layers tend to fall off in production a little faster in the later part of the ... season so that the first-year curves gradually separate toward the end. ... was less noticeable in second-year production. High layers and low layers ... the first and second years showed almost perfect agreement in distribu... with the curve of the low layers uniformly lower than that of the high ... or the difference slightly widening toward the ends. The distribution of ... duction does not seem to be at all affected by age up to three years at ... but total production affects distribution regardless of age. . . .

"Winter egg production of flocks is more variable than annual produc... This variation seems to be closely correlated with environmental fa... Flocks that made low winter records their first season made high ones ... second, and vice versa. The flocks that made low records the first win... made higher three-year records than the high first-year flocks." The corr... tion between the first-winter production and that of later years averaged ... 0.25. This correlation is less for the high first-year flocks than for the ... ones. The higher the production of an individual the greater the percentage ... this production that will be made in the "winter" period regardless of age.

The correlation between winter production (November 1 to February ... and total production of the same year, as shown by 18 flock records from ... to 1912, inclusive, averaged 0.5848. This correlation was found to decr... slightly with age, the averages for the six years being 0.6325 between the ... winter and first year, 0.5862 between the second winter and second year, ... 0.5351 between the third winter and third year.

"The winter period as used does not seem correctly to represent a biologic ... entity, but is made up of the end of one period and the beginning of another. There does not appear to be any foundation for the assumption of a division of the laying period into units. It appears that there is a fairly definite 'productive rhythm' that not only affects annual production, but even influences the seasons so that a high fall production will be followed by a low spring one and vice versa.

"The date of hatching when kept within a two-month period within the months of March, April, and May did not appear to affect total production in three years. The time between hatching and laying, while varying considerably under different environmental conditions, affected the total production in three years. The latest maturing pullets were always poorer producers."

Egg-production data from other sources are tabulated and discussed, for which it is noted that "the distribution of production of Leghorns in other flocks, including egg-laying contests, was found to agree with the corresponding curves from the Utah flocks. The distribution of production in the general-purpose breeds was found to be quite different from that of the Leghorns. The curves of the general-purpose breeds reached their maximum early in the season and then rapidly fell off again to very moderate production, from which

they gradually declined to the end of the season, while the Leghorns reached their maximum a month or more later, but continued to produce heavily for several months and then rapidly fell off at the end."

Selection. The basis of improving the poultry flock, H. R. LEWIS (*New Jersey Stas. Hints to Poultrymen, 5 (1917), No. 12, pp. 4*).—Brief directions are given for improving the egg production of flocks of hens by eliminating the poor producers, the basis of selection being the external appearance of the individual hens. It is stated that when culling a flock of yearling hens in the fall the following factors should be studied in the order named, and the final decision with regard to the possibilities of each bird made on the basis of a combined grouping of all the factors: Health, or freedom from disease; weight, or condition of flesh; vigor and stamina; condition of comb; pigmentation—amount of yellow in vent, ear lobes, beak, and shanks; condition of pelvic arch—size and pliability of lay bones, and distance between lay bones and from keel to pelvic bones; and condition of plumage—degree of molt, if any.

Feed cost of egg production. Results of three years' experiments at the Government poultry farm, H. M. LAMON and A. R. LEE (*U. S. Dept. Agr. Bul. 561 (1917), pp. 42, pls. 8, figs. 5*).—Owing to the lack of complete data on the feed cost of egg production on general farms, this experiment was undertaken at Beltsville, Md., in 1912 with 6 pens of 30 pullets, later increased to 10 pens. Only the feed costs are considered, as the fowls were mostly on free range. Some of the results of the work are as follows:

The average egg yield for the first-year pullets was 131, at a cost for feed of 10 cts. a dozen; the second year, 92.7, at a cost of 14 cts.; the third year, 75.2, at a cost of 19 cts. The average value of eggs over feed cost the first year was $2.56 per hen, second year $1.41, third year $0.79.

Oats were not found necessary in the ration, but added variety. With the growing fowls, especially, great gains were made with beef scrap or other animal protein. Cottonseed meal apparently produced brown or greenish spots on the yolks, rendering many of the eggs unfit for market. Fish meal at $7 a ton seems can replace beef scrap with no unfavorable effect on the quality of the eggs.

No advantage was found in allowing the fowls to select their own mash constituents over feeding the mixture.

In comparison of Leghorn and general-purpose fowls, it was noted that the Leghorns ate an average of 55 lbs. of feed annually at a cost of 87 cts., the general-purpose fowls 72 lbs. at a cost of $1.13. The Leghorns produced eggs about 3 cts. per dozen cheaper during their first year than the general-purpose hens, 6.4 cts. cheaper the second year, and 9.8 cts. cheaper the third year. The annual decrease in production was much less with the Leghorns than with the general-purpose breeds. The average weight per dozen of the eggs from the Leghorns during the first year was 1.45 lbs., second and third years 1.49 lbs.; from the general-purpose fowls, first year 1.53 lbs., second year 1.6 lbs., and third year 1.63 lbs.

Eggs were produced at the lowest cost in the spring and at the highest cost in the fall.

Poultry feeds and feeding results, R. N. HARVEY (*Texas Sta. Bul. 206 (1917), pp. 3–16, figs. 4*).—Part one of this bulletin consists of a discussion of Texas-raised feeding stuffs suitable for poultry, and includes methods of feeding and some rations that have proved satisfactory.

Part two is a report of results of a feeding test carried on for five periods of four weeks each for the purpose of comparing meat scrap, cottonseed meal, meat scrap and cottonseed meal, and sour skim milk as supplements of milo maize, wheat bran, and wheat shorts for laying hens. The fowls receiving meat

scrap produced well during the first three periods, and those receiving sour skim milk did well throughout the whole 20 weeks. The flocks receiving cottonseed meal and cottonseed meal with meat scrap gave very poor results, the former being very low twice, high once, but falling again. The latter was lowest one month, but was next to the lowest all other times. During the 20 weeks the hens fed cottonseed meal laid an average of 62.68 eggs and returned a profit of 77.98 cts. each over the cost of feed; those fed meat scrap laid an average of 67.86 eggs per hen, at a profit of 85.67 cts.; those fed meat scrap and cottonseed meal averaged 63.81 eggs each, at a profit of 72.8 cts.; and those fed sour skim milk an average of 71.29 eggs, at a profit of 87.54 cts. per hen.

Poultry farm management, R. E. JONES, I. G. DAVIS, and B. A. MILLER (*Conn. Agr. Col. Ext. Serv. Bul. 8 (1917), pp. 16, figs. 4*).—A study of the poultry business in Connecticut, based on the operation of 42 farms during one year. Receipts, expenditures, and inventories are noted, while labor income is taken as the measure of profit.

The average net receipts were $1,312. Deducting interest on capital at 5 per cent, $560, this gave a unit labor income of $752.

The range of egg production was from 54 to 160, averaging 97 per hen for the year. Receipts from market eggs were 46 per cent of the total, and nearly four times as much as from any other single source. The necessity for increased average egg production is emphasized.

Forty-eight per cent of the expense on these farms was for feed. The home production of more feeds and the cooperative buying of others is suggested as means of lowering costs.

The greatest returns were made on the farms with the largest range. The importance of range and shade are noted.

The number of poultry units per man varied from 319 to 2,000. The highest efficiency lay between 800 and 1,500. With less than 500 a man can not make a profit, and with more than 1,500 he can not give them the necessary care for best results. The ratio of poultry units to laying hens was 100:68. The larger farms gave the higher percentages of profit, owing to greater efficiency of labor, machinery, and capital.

Finishing market poultry, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 5 (1917), No. 14, pp. 4*).—Market requirements and the best methods to market poultry at a profit when there is a tendency to become overstocked in certain classes are discussed.

DAIRY FARMING—DAIRYING.

Dairy laboratory manual and notebook, compiled by E. L. ANTHONY (*Philadelphia and London: J. B. Lippincott Co., 1917, 2. ed., rev., pp. 72, figs. 15*).—A revised edition of these laboratory exercises (E. S. R., 31, p. 494).

Dairy cattle, A. LEITCH, H. M. KING, and J. P. SACKVILLE (*Ontario Dept. Agr. Bul. 253 (1917), pp. 72, figs. 23*).—A general treatise on the economy of dairy farming, breeds of Ontario dairy cattle, principles of nutrition, use of feeds, general problems in dairying, care and management of dairy cattle, common diseases, and plans for the construction and equipment of dairy barns.

Experiments on the use of palm kernel nut cake as a food for dairy cows, A. LAUDER and T. W. FAGAN (*Edinb. and East of Scot. Col. Agr. [Pamphlet] 1916, pp. 9*).—Two experiments are here reported in which palm kernel nut cake and Bombay cottonseed cake were compared as feeds for dairy cows.

In the first experiment, which was conducted during the winter of 1915–16, two lots of nine Shorthorn dairy cows each were fed for eight weeks a

ration of 4 lbs. bran, 1 lb. locust bean meal, 75 lbs. turnips, and oat straw, supplemented by 4 lbs. palm nut cake for lot 1 and 4 lbs. cottonseed cake for lot 2. The weekly yield of milk before the experiment was 17.25 lbs. more for lot 2 than for lot 1. During the eight weeks of the experiment lot 1 produced 11,215.75 lbs. and lot 2, 10,962.75 lbs. of milk.

During the summer of 1916 two lots of eight cows each were fed for seven weeks on pasture supplemented with 4 lbs. cottonseed cake, 4 lbs. bran, and 1 lb. locust bean meal per day for lot 1, and 4 lbs. palm nut cake, 4 lbs. bran, and 1 lb. locust bean meal for lot 2. Previous to the experiment the milk yield of the two lots was practically equal. During the experiment the milk yield was 13,622.5 lbs. for lot 1 and 12,836.25 lbs for lot 2. The animals ate the palm kernel nut cake less readily than the cottonseed cake.

Analyses are given of the concentrates used in these experiments.

Calf feeding experiments (*Dept. Agr. and Tech. Instr. Ireland Jour., 17 (1917), No. 2, pp. 257–259*).—In a series of experiments at 30 centers in 17 counties crushed oats was compared with a standard calf meal composed of ground linseed, oat meal, and maize meal (1:2:2).

In the experiments, which lasted an average of 116 days, 202 calves were used. They averaged one-half week of age at the beginning of the test. The crushed oats ration was fed dry and the calf meal was steeped in hot water for 12 hours. An average daily gain of 1.41 lbs. per head was made on crushed oats and 1.44 lbs. on the calf meal. On the basis of prewar prices, the cost of production was 5s. 3d. per hundredweight (1.1 cts. per pound) less on crushed oats than on the calf meal.

The business of ten dairy farms in the blue grass region of Kentucky, J. H. ARNOLD (*U. S. Dept. Agr. Bul. 548 (1917), pp. 12*).—A brief analysis is given of 10 dairy farms found among the 187 farms previously noted (E. S. R., 36, p. 789).

The average labor income on these 10 dairy farms was $1,773 and on the 187 farms $750. The labor income on the seven successful farms of the ten varied from $6,408 to $1,121. The principal source of income on these farms was market milk, with cream next in importance, while very little butter was marketed. Receipts from the dairy represented 71 per cent of the total, the remainder consisting of tobacco (5.8 per cent), wheat, steers, poultry, and the sale of dairy cows, young stock, and calves. It is estimated that the cost of feed per cow on these farms varied from $40 to $50. The advantages of the blue-grass region for dairying are discussed.

A comparison of the seven more successful farms is made with the average of the whole group of ten. It is noted that "the average successful farm had the largest business, as shown by the size of farm, the number of dairy cows, and the working capital. On the average successful farm there were more receipts from crops and miscellaneous sources than were shown for the average of the ten farms. This indicates the greater degree of diversity on the successful farms. The most important comparison is that shown for the receipts per cow [$164 and $126, respectively]."

The effect of the ingestion of desiccated placenta on the variations in the composition of human milk during the first 11 days after parturition, F. S. HAMMETT and L. G. MCNEILE (*Jour. Biol. Chem., 30 (1917), No. 1, pp. 145–153*).—The results of this study demonstrate that the ingestion of desiccated placenta has an effect upon the factors concerned in the regulation of the chemical composition of milk. There is a stimulation of the sugar- and protein-producing mechanism with an apparent depression of the function of the fat-secreting apparatus.

From the peculiar characteristics of milk protein and carbohydrate it is presumable that these constituents are largely elaborated by the gland itself. Milk fat is apparently the sum total of the secretory and excretory activities of the mammary gland, the former being concerned with the elaboration of the fat peculiar to milk and the latter concerned in the inclusion in the milk of a part of the ingested fat as such. The evidence for this is admittedly incomplete. From the fact that the ingestion of desiccated placenta tends to produce a milk of greater uniformity in the change of production direction of fat, it does not seem improbable that its action may be stimulative to the secretory activity of the gland in this respect also.

A bibliography is included.

The modern milk problem in sanitation, economics, and agriculture, J. S. MACNUTT (*New York: The Macmillan Co., 1917, pp. XI+258, pls. 16, figs. 22*).—This book, which consists largely of a compilation of data from various sources, is a treatise on the practical, economic, and sanitary factors involved in supplying cities with pure milk.

Comparisons of the rate of gas production by certain bacteria in raw and in pasteurized milk, P. W. ALLEN (*Jour. Infect. Diseases, 21 (1917), No. 3, pp. 219–225, figs. 3*).—In this comparison of the physiologic activity of bacteria in milk all factors were the same with the exception that part of the milk was raw and part was pasteurized at 60° C. (140° F.) for 30 minutes. It was found that pasteurization caused milk to become more favorable to the attack of the gas-forming colon bacilli and *Bacillus œrogenes*. These results indicate that pure raw milk has a power of resisting changes which the same milk does not possess when pasteurized.

The significance of colon bacilli in milk, S. H. AYERS, L. B. COOK, and P. W. CLEMMER (*Abs. Bact., 1 (1917), No. 1, pp. 52, 53*).—In some experimental work in which a large number of samples of fresh milk produced under various conditions were examined, it was found that colon bacilli were present in 0.01 cc. in only a small percentage of the samples. When these organisms were found, their numbers ranged from 100 to 400 per cubic centimeter. There was apparently no increase in the colon count in milk held for 24 hours at 10° C. (50° F.) but a very great increase at 15.5° C. (60° F.).

In order to determine how many colon bacilli could be introduced into fresh milk, an examination was made of 70 samples produced under extremely filthy conditions and handled in unsterilized utensils. These conditions were far worse than would probably be found on any farm, yet in only 32 of the 70 samples were colon bacilli found in 0.01 cc. of fresh milk. The number of these organisms found in the 32 samples ranged from 100 to 28,400 per cubic centimeter, but only one sample showed more than 2,000. Leaving out this sample the average colon count of the 31 samples was 648 per cubic centimeter.

The influence of gargety and high count cows on the number of bacteria in milk, R. C. COLWELL (*Abs. Bact., 1 (1917), No. 1, pp. 48, 49*).—The investigation of a sanitary dairy of 140 cows from which raw milk was retailed in the city of Providence, R. I., showed two factors to be responsible for the production of milk with more than 10,000 bacteria per cubic centimeter, (1) high count cows, cows whose freshly and aseptically drawn milk contains more than 10,000 bacteria per cubic centimeter, and (2) gargety cows, cows affected with incipient, acute, or chronic mammitis. The results of 243 tests of individual cows showed that 72 per cent of the cows were producing milk containing less than 10,000 bacteria per cubic centimeter, and 28 per cent were cows of the high count type.

A certain few of these high count cows were infected with mammitis in one quarter of the udder and a bacteriological examination of each teat of such

eyes was made. In every instance where by physical examination one quarter was known to be infected one or more of the apparently healthy quarters proved to be infested with similar organisms. The custom of discarding only the milk from the infected quarter and of adding the milk from the remaining quarters to the whole milk of the herd was therefore responsible for infecting the entire herd with the garget milk.

Dairy laws of Wisconsin (*Madison, Wis.: Dairy and Food Comr., 1917, pp.* ...). The text is given of the dairy laws of Wisconsin and of rules and regulations effective July 1, 1917, governing the licensing of butter makers and cheese makers and operators of butter and cheese factories, adopted by the dairy and food commissioner under authority of law.

Testing milk for butter fat by the Babcock test, compiled by W. E. EVANS (*Waterville, Pa.: Author, 1917, pp. 16, figs. 13*).—Brief directions are given for making the Babcock fat test on whole milk, together with notes on the causes of variation in the fat content of milk.

Accounting records for country creameries, J. R. HUMPHREY and G. A. NAHSTOLL (*U. S. Dept. Agr. Bul. 559 (1917), pp. 37*).—This bulletin contains copies of forms and a description of their uses for a system of accounts which is being recommended by the Bureau of Markets and by the Dairy Division of this Department as a uniform system of accounting for country creameries. It is stated that the system presented is the result of careful study and practical experience in creameries operating under widely varying conditions.

Experiments with pepsin to replace rennet, D. W. STEUART (*Jour. Bd. Agr. [London], 24 (1917), No. 1, pp. 57–59*).—The author made up a pepsin solution that compared favorably with standard rennet extract and kept well. Cheese made by the use of the pepsin solution compared favorably with rennet cheese. In making a gallon of the pepsin solution, he advises the use of 13½ oz. of ... soluble pepsin powder, 2 lbs. salt, 3 oz. boric acid, and 1 gal. water. The brine must be cooled to 104° F. after boiling, before dissolving the pepsin. The solution should be filtered after a day or two.

Loss of fat in the whey when using pepsin, G. H. BARR (*Agr. Gaz. Canada, 4 (1917), No. 8, pp. 660–662*).—Tabulated results are given of cheese making experiments at the Finch Dairy Station from February 23 to May 10, 1917.

In using pepsin, the best results were secured by setting at a temperature of 85° F. and using enough pepsin to coagulate the milk ready to cut in from 25 to 30 minutes. Setting the milk at temperatures over 86° increased the loss of fat in the whey in nearly every case. The loss of fat in the whey was lessened by increasing the quantity of pepsin per 1,000 lbs. of milk from 4 oz. to 5.5 and 6 oz. Developing the acidity in the milk so that the curds dipped in less than 2 hours and 15 minutes from time of setting increased the loss of fat in the whey to a marked extent. It was found advisable to allow the curd to set fairly firm but not too firm before cutting.

Varying conditions in the milk from day to day as found in cheese factory work apparently affect the loss of fat in the whey to a greater extent when pepsin is used than when rennet extract is used. Care must therefore be exercised in cutting and stirring the curd when making cheese with pepsin.

On the formation of "eyes" in Emmental cheese, W. M. CLARK (*Jour. Dairy Sci., 1 (1917), No. 2, pp. 91–113, figs. 2*).—A review of the literature reveals little or no evidence that the eyes of Emmental cheese are strictly localized at points of excessive bacterial growth. On the contrary the evidence of bacterial counts and direct microscopical examination, as well as the gas production of different regions of the cheese, indicate a more or less uniform distribution of the eye distending gas.

Certain theoretical considerations are presented which lead to the hypothesis that the gas separates in aggregates according to laws governing the separation of gas from supersaturated aqueous solutions. This hypothesis has been tested upon viscous media with results directly applicable to the "eye" and "Nissler" hole formations in cheese.

It is concluded that the gas produced in Emmental cheese separates in aggregates whose localities have no necessary relation to the points where the gas is produced, and that a rapid gas production must tend to the formation of numerous small holes while a slow gas production must admit the formation of larger holes. This conclusion is shown to agree with the fact that Nissler holes are produced by a rapid fermentation while eyes are formed slowly. This conclusion also suggests that the gas of Nissler holes must separate at numerous points near its point of origin without regard to any particular locality of the cheese, while the eyes must form at favorable points. This was experimentally verified by a study of stained cheeses.

An extensive bibliography is given.

VETERINARY MEDICINE.

[Live stock diseases] (In *Live Stock of the Farm, edited by C. B. Jones. London: The Gresham Publishing Co., 1915, vol. 4, pp. 159–252, figs. 18; 1916, vol. 5, pp. 101–134, 249–269*).—The diseases of sheep are dealt with by T. W. Cave in volume 4 (pp. 159–252); and the diseases of pigs (pp. 101–134) and of poultry (pp. 249–269) by H. Leeney in volume 5.

New and nonofficial remedies, 1916 (*Chicago: Amer. Med. Assoc., 1916, pp. 428+XXII*).—Descriptions are given of the articles which had been accepted by the council on pharmacy and chemistry of the American Medical Association prior to January 1, 1916.

Sugar in the treatment of wounds, S. KOHEYA (*Chosen Igaku Kai Zassi, No. 13 (1916), pp. 11–18; abs. in Japan. Med. Lit. [Korea], 2 (1917), No. 1, pp. 7, 8*).—The successful use in wound treatment of commercial granulated sugar is reported. The sugar was found to inhibit the growth of most of the bacteria liable to be found in wounds. It possessed no disinfecting power, but stimulated tissue granulation and the formation of epithelial cells, prevented putrefaction of the secretions, and reduced the odor.

The use of chloramin-T paste for the sterilization of wounds. M. DUFRESNE (*Jour. Expt. Med., 26 (1917), No. 1, pp. 91–93*).—"Dakin's tolueno-sodium *p*-sulphochloramid, mixed with sodium stearate, forms a paste sufficiently active and stable to be used in the treatment of wounds."

Sterilization of wounds with chloramin-T, A. CARREL and ALICE HARTMANN (*Jour. Expt. Med., 26 (1917), No. 1, pp. 95–118, figs. 20*).—"Under the conditions of our experiments chloramin paste maintains the asepsis of a wound already sterile, and sterilizes an infected wound. Under the same conditions chloramin paste causes no apparent modification of the cicatrization curve of an aseptic wound."

Dichloramin-T in the treatment of the wounds of war, J. E. SWEET (*Jour. Amer. Med. Assoc., 69 (1917), No. 13, pp. 1076–1078; Brit. Med. Jour., No. 2977 (1917), pp. 249, 250*).—The author concludes that Dakin's dichloramin-T in solution in eucalyptol and paraffin oil is of great advantage in wound treatment, even when the final results in wound healing are no better, because it saves the pain of wound dressing, it effects an appreciable saving of dressing material, the amount of solution is of small bulk, the number of wounds which a surgeon can dress in a given time is far greater than by any other method

and the elimination of the Carrel tube simplifies the dressing, the problem of transportation of the wounded, and the time taken for the periodic flushing.

The relation between the thromboplastic action of cephalin and its degree of unsaturation, J. McLEAN (*Amer. Jour. Physiol., 43 (1917), No. 4, pp. 586–607, fig. 1*).—Experiments with various samples of cephalin have shown that its thromboplastic action bears a direct relation to its degree of unsaturation. The greater the degree of unsaturation the greater the thromboplastic activity. Cephalin saturated beyond a certain degree, either by reduction or oxidation, loses completely its thromboplastic activity. The material in solution which has become saturated or partly saturated yields an acid reaction and retards the coagulation of blood. With increasing saturation the material gradually loses its property of solution in ether and chloroform.

It is noted that cephalin is most effective in its coagulative power shortly after its isolation from the tissues.

The reaction of sera as a factor in the successful concentration of antitoxic sera by the methods at present in use, ANNIE HOMER (*Biochem. Jour., 11 (1917), No. 1, pp. 21–39, figs. 2*).—The results of the study reported show that in the Banzhaf[1] method for concentration of antitoxic sera the uncertainties of filtration are due to no account having been taken of the reaction of the serum, and that, as the precipitating power of 30 per cent ammonium sulphate is not appreciably increased during the heating, a certain amount of euglobulin escapes precipitation with the first fraction precipitate and appears in colloidal suspension in the final product. "The uncertainties in the filtration of the hot serum-ammonium-sulphate mixtures in the above method can be obviated by an adjustment of the hydrogen ion concentration. The filtration can also be improved by the addition of sodium chlorid to the mixtures, but in this case the improvement is due to a specific action of salt on the globulins."

Euglobulin can be completely eliminated by adjustment of the hydrogen ion concentration of the serum mixtures to the point at which the desired increased precipitation is assured, by brine extraction of the second fraction precipitate containing the pseudoglobulin-antitoxin combination, subjecting the serum to a preliminary prolonged heating at from 57 to 58° C., and the addition of organic substances such as phenol and its homologues, ether, or chloroform. "The extent of the heat denaturation of the serum proteins during the heating of serum at 57° for several hours is also influenced by the hydrogen ion concentration of the serum and can be controlled by the adjustment of the latter. The denaturation induced by heat in alkaline sera apparently does not involve the same type of change as that induced in acid sera."

Equilibria in precipitin reactions.—The coexistence of a single free antigen and its antibody in the same serum, S. BAYNE-JONES (*Jour. Expt. Med., 25 (1917), No. 6, pp. 837–853, fig. 1*).—In the study reported the purified proteins, edestin from hempseed and crystalline ovalbumin from fresh eggs, were used as antigens. Although the albumin isolated was considered as pure as is obtainable by chemical means, moderately severe anaphylactic reactions were produced by it in animals sensitized with ovoglobulin. It is noted that "anaphylactic tests of the individuality of a protein can not be any longer regarded as the criterion of the purity of the substance as an antigen. . . .

"With edestin and crystalline egg albumin as antigens, phases in the precipitin reaction were found in which these substances and their specific precipitins could be demonstrated to be coexistent but ununited in the same serum. When edestin or crystalline egg albumin is injected into a rabbit immunized thereto, the antigen may be found in the circulating blood during 48 hours after

[1] Collected Studies Research Lab, Dept. Health N. Y. City, 4 (1908–9), pp. 230–232.

its injection, while at the same time the animal maintains a high titer of free precipitin in its blood. When the pure protein antigen is mixed in proper proportions with the serum of a specifically immunized rabbit and the resulting precipitate removed by centrifugation, the supernatant fluid contains both antigen and antibody. The serum drawn from a rabbit during the period in which free antigen and antibody are coexistent in the circulation undergoes slow spontaneous precipitation when kept in sterile tubes in the ice box." The interaction appears to take place according to a definite law.

The protective action of a solution of egg albumin as a third colloid inhibiting precipitation in a reaction between human serum and its antibody was demonstrated.

Notes on the outbreak of foot-and-mouth disease at Butleigh, Somerset, R. N. GRENVILLE (*Jour. Bath and West and South. Counties Soc., 5. ser., 11 (1916–17), pp. 82–84*).—Evidence is presented which indicates that the infection was carried to cows at Butleigh by a cart, probably in the mud on its wheels.

The value of the ophthalmic and conglutination tests in the diagnosis of glanders, E. GRÄUB (*Schweiz. Arch. Tierheilk., 59 (1917), No. 3, pp. 129–154*).—In the examination of a large number of remounts the ophthalmic reaction was found to yield fairly satisfactory results, although some doubtful reactions were obtained. The conglutination test was the most reliable, no doubtful reactions having been observed in the examination of 3,000 sera.

The ophthalmic reaction and a simplified conglutination reaction are described in detail. In the simplified technique, horse serum is used instead of guinea pig serum to furnish complement.

The temperature required for the "inactivation" of mule blood for the complement fixation test for glanders, J. B. BUXTON (*Vet. Jour., 73 (1917), No. 505, pp. 245–247*).—In the examination of blood samples from a large number of mules by the complement fixation method it was found that an unusually large number of animals gave a definite positive or an indefinite reaction. Postmortem examination of certain animals which had given a positive reaction to the complement fixation test failed to show the presence of glanders lesions. The indefinite reaction was found to be due to insufficient inactivation of the mule serum and a consequent destruction of anticomplementary bodies. Experimental data submitted show that heating of the serum to 62° C. for one-half hour is necessary for complete destruction of these anticomplementary bodies.

Transmission of pulmonary and septicemic plague among marmots, WU LIEN-TEH and F. EBERSON (*Jour. Hyg. [Cambridge], 16 (1917), No. 1, pp. 1–11*).—Of marmots placed in contact with marmots infected with plague by inhalation, "52.6 per cent developed pulmonary plague and died within four to six days. Marmots suffering from pneumonic plague are infective at an early stage of the disease and the animals which such marmots infect acquire plague after a short incubative period.

"Pulmonary plague can be readily transmitted to the small marmot (*Spermophilus citellus*), and these animals, when suffering from pulmonary plague, are in turn capable of transmitting the same type of plague through the respiratory passages. Septicemic plague can be developed in marmots very easily as a result of respiratory infection, and also by direct subcutaneous inoculation with small amounts of culture. The marmot can acquire plague by way of the alimentary tract and spread the disease by feeding on plague-infected carcasses. The histological appearances observed in the lesions of these cases are characteristic."

In an appended note G. H. F. Nuttall reports upon the identification of ectoparasites collected from marmots by the senior author. These included a flea determined by Rothschild as a slightly aberrant specimen of *Ceratophyllus famulus* and a number of ticks closely resembling *Hæmaphysalis koningsbergeri*.

Note on the transmission of animal trypanosomiasis in northern Rhodesia by bloodsucking flies other than Glossina, F. CHAMBERS (*Vet. Rev., 1 (1917), No. 3, pp. 222–227*).—"From the evidence obtained it would appear that the trypanosome can be and is spread in tsetse-free areas by the agency of biting flies. That Tabanidæ are the worst offenders is becoming realized. Pangonia and Stomoxys have also been shown to be transmitting agents, and it is possible that any bloodsucking fly can transmit trypanosomiasis mechanically."

Tuberculosis and animal breeding, U. DUERST (*Schweiz. Arch. Tierheilk., 59 (1917), Nos. 2, pp. 65–91, figs. 2; 3, pp. 154–173, fig. 1*).—This is a general discussion of the subject, together with some original experimental data.

The author shows that the statistical data in regard to the frequency of tuberculosis in man as well as in animals, reported by districts, or findings in abattoirs do not, in general, give a correct indication of the spread of the disease among animals. The classification by age should be taken into account. As has been earlier suggested, the frequency of tuberculosis increases with age, but only to a definite point. This establishes an average curve of the frequency of the disease, and by its use the frequency can be calculated in any locality if the age classification of the animals in the particular locality is known.

In regard to the spread of the disease, the dust in the stable plays an important part, as well as the general condition of the stable. The larger the stable and the more animals together, the greater is the percentage of infections. It is indicated that more attention should be paid to construction of buildings for the animals. Small compartments, rather than the housing of many animals in one large compartment, are recommended.

The degree of susceptibility is considered to depend on the general state of the constitution of the animal. Experimental data show that excessive inbreeding weakens the constitution. Acclimatization and too frequent pregnacies are also considered to weaken the constitution and to be predisposing factors to the disease.

A bibliography of 81 references to the literature cited is appended.

Presence of tubercle bacilli in the feces of cattle in dairy herds, R. S. WILLIAMS, W. M. SCOTT, T. ROBERTS, and W. A. HOY (*Vet. News, 14 (1917), Nos. 695, pp. 171–173; 696, pp. 180–184, figs. 2*).—Samples of feces from 179 cows were examined for tubercle bacilli. Eliminating the cases which did not react to the tuberculin test and the tests which failed, virulent tubercle bacilli were found in the feces of 3 of the remaining 158 animals.

The experimental technique used is described and the results of the investigation discussed.

The incidence of bovine infection of tuberculosis in man, CHUNG YIK WANG (*Jour. Path. and Bact., 21 (1917), No. 2, pp. 131–172*).—The author divides the cases of tuberculosis examined by him into the following groups: Cases which showed definite active lesions of tuberculosis in the body on microscopic examination; cases which, while showing no evidence of a definite active tuberculous infection in any part of the body, revealed certain lesions apparently of a tuberculous nature in the form of caseous glands or calcareous deposits in the glands or the lungs; cases in which either no change or only a simple increase in size or softening of one or more glands, unassociated with any evidence of

tuberculosis, could be demonstrated; and cases in which the sputum alone was examined.

The cases coming under the third group have been previously reported[1] as well as those under the fourth group (E. S. R., 37, p. 180).

The 123 strains of tuberculosis bacilli obtained from 88 cases under groups 1 and 2 were investigated bacteriologically and found to conform to either human or bovine types of the bacillus. No atypical strain was demonstrated. When two or more strains were isolated from a single case their cultural characteristics were identified. Out of 68 cases of adults, bovine tubercle bacilli were separated in 7 instances, 1 from 29 sputum cases, 2 from 4 cases of abdominal tuberculosis, 2 from 7 cases of generalized tuberculosis, and 2 from 28 cases in which the only signs of the disease were the calcareous or caseous lesions. Three of the bovine cases gave indication on post-mortem examination that the path of infection was by way of the intestine. In three others the evidence of primary infection was inconclusive, while in the remaining case (sputum case) no post-mortem was performed.

The bacteriological examination of 20 cases in children resulted in the isolation of the bovine type in 11 instances. In 9 of these cases the primary site of infection was found to be in the intestine. In the remaining 2 instances the evidence was inconclusive.

The protocols of the cases of groups 1 and 2 are submitted, together with the bacteriological data, in detailed tabular form.

A bibliography of 26 references to the literature is appended.

Tuberculosis in carnivorous animals, W. R. BLAIR (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 6, pp. 750–767*).—This is a general discussion of the prevalence, symptoms, and lesions of the disease, together with a number of case reports of dogs, cats, and other carnivorous animals in captivity.

The author's experience in the use of tuberculin as a diagnostic agent in dogs has been unsatisfactory. Its use on cats is indicated as being uncertain and dangerous for animals free from the disease.

Tuberculosis in the horse, F. CHAMBERS (*Vet. Jour., 73 (1917), No. 505, pp. 242, 243*).—The author reports four cases of tuberculosis in the horse, the diagnosis of which was made on post-mortem examination. Autopsical data are included.

During the life of the animals tuberculosis was not suspected in any of these cases. It is thus indicated that all cases of general debility which show no improvement in a few weeks should be tested for tuberculosis.

Antituberculosis vaccination, RAPPIN (*Compt. Rend. Acad. Sci. [Paris], 164 (1917), No. 10, pp. 421, 422*).—The preparation of a vaccine which yielded good results is described as follows:

Tubercle bacilli obtained from bouillon cultures of different ages and desiccated for 24 hours are treated with a 2 or 3 per cent solution of sodium fluorid for several days. By this treatment the organisms lose their infective powers but retain their toxic properties. The bacilli are washed with physiological salt solution and then submitted for a longer or shorter period to the action of an antituberculosis serum. This emulsion of the bacilli in the serum constitutes the vaccine.

Effect of tethelin on experimental tuberculosis, H. J. COPPER (*Jour. Infect. Diseases, 21 (1917), No. 3, pp. 269–278*).—The subcutaneous injection of 25-mg doses of tethelin, isolated by Robertson (E. S. R., 35, p. 8), on alternate days for 18 days into guinea pigs infected with virulent human tubercle bacilli had no appreciable effect on the progress of the disease or the duration of life of

[1] Lancet [London], 1916, II, No. 10, pp. 417–419.

the experimental animals. The daily subcutaneous administration of 25-mg. doses of tethelin to guinea pigs sensitized by dead and living human tubercle bacilli had no appreciable effect on the development, recession, or rupture of intracutaneous tubercles produced by dead human tubercle bacilli nor on deep puncture wounds of the skin in the animals used.

Observations on the presence of the Bacillus abortus bovinus in certified milk, E. C. FLEISCHNER and K. F. MEYER (*Amer. Jour. Diseases Children, 14 (1917), No. 3, pp. 157–173*).—This is a report of preliminary studies at San Francisco, Cal., accompanied by a list of references to the literature.

The authors conclude from the examination of a limited amount of material that "*B. abortus* is, for practical purposes, always present in the certified milk produced in the San Francisco Bay regions. Tubercle bacilli are not present in this same milk in sufficient number to give tuberculosis to guinea pigs, although this conclusion may prove incorrect on further experimentation. If the above conclusion is correct, there is no necessity for pasteurizing certified milk on account of any danger that it may possess as a disseminator of bovine tuberculosis to infants.

"It is not unlikely that, in many previous milk tests for tubercle bacilli, the anatomic lesions of bovine abortion disease in the guinea pig were mistaken for tuberculosis. If the *B. abortus* is present in certified milk to the extent evident from these experiments, it is difficult to consider it pathogenic for infants, without, so far as is known, ever having produced recognizable lesions on post mortem examination. The result of this work, however, is one more definite indication that it is of greatest importance to study the abortus problem from every angle to be absolutely certain of its bearing on the health of infants."

Tick eradication laws and regulations of the State of Arkansas, R. M. GOW (*Arkansas Sta. Bul. 132 (1917), pp. 8*).—The text of the State tick eradication laws and regulations is given, with notes.

A note on the immunity of suckling pigs to hog cholera, R. R. BIRCH (*Cornell Vet., 7 (1917), No. 3, pp. 199, 200*).—The author notes an instance in which two pigs of a hyperimmune sow died from natural exposure to hog cholera at the ages of 31 and 37 days, respectively. Another pig from the same litter died at the age of 27 days, but there was some doubt as to the definite cause of death in this animal. The pigs were all nursed by a hyperimmune mother until they refused food on account of sickness.

It is indicated that "these observations add emphasis to the fact that, although pigs of immune sows are often immune while being sucked, it is not always safe to depend on this immunity."

A serum test influenced by Ascaris infestation, R. R. BIRCH (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 5, pp. 694–696*).—The author, who has frequently observed that when exposed to hog cholera pigs infested with ascarids die much more quickly than normal ones, especially if the parasites have entered the gall duct, has found that ascarids are responsible for the differences obtained from serum and virus. He thinks it quite probable that disastrous results would follow simultaneous treatment of pigs badly infested if light doses of serum were administered.

Experiments in filtration of antihog-cholera serum, B. H. EDGINGTON, A. BIGERMAN, and E. W. PORTER (*Jour. Infect. Diseases, 21 (1917), No. 3, pp. 258–261*).—In the study reported attempts were made to produce bacteria-free antihog-cholera serum by passage through Berkefeld and Chamberland F filters.

The results obtained indicate that the immune bodies of antihog-cholera serum are restrained by filtration through Chamberland F filters. The Berke-

the total number examined 1,295 were from private supplies, of which 570 came from deep wells, 555 from shallow wells, 37 from cisterns, and 63 from springs; 785 of the private supplies were potable, 437 were bad, and 73 doubtful.

Of the total number of 690 deep well supplies examined 552 were classed as good, 103 as bad, and 35 of doubtful quality. Of the 569 shallow well samples analyzed but 243 were good, 291 were bad, and 35 were of doubtful quality. Of the 84 springs analyzed 56 were found to be good, 21 bad, and 7 were of doubtful quality. Of the 37 cistern waters examined but 14 were good, 18 were listed as bad, and 5 were of doubtful quality. Nineteen of the 23 pond and lake supplies examined were good and 4 were bad.

Sterilization of water in the field, H. PENAU (*Jour. Pharm. et Chim.*, 7, ser., *13 (1916), No. 12, pp. 377–385; abs. in Chem. Abs., 10 (1916), No. 19, p. 2587*).—A process is described in which a solution of sodium hypochlorite containing 10 gm. of active chlorin per liter is prepared by double decomposition of calcium hypochlorite with sodium carbonate and potassium permanganate and added at the rate of 0.5 liter per 1,000 liters of water. After 45 minutes 60 cc. of an aqueous 10 per cent solution of sodium thiosulphate is added. It is found that colon bacilli are destroyed while the odor and taste of the water are not impaired.

Sewage disposal for school buildings in Ohio, R. S. DURRELL and H. E. ADAMS (*Ohio Pub. Health Jour., 7 (1916), No. 8, pp. 326–338, pls. 6*).—The purpose of this bulletin is to acquaint boards of education, and their architects and engineers, in the general methods of sewage disposal for school buildings not accessible to sanitary sewers, and in the design of the separate features involved. It is not intended to provide standard working drawings for the construction of sewage-treatment plants for these buildings. The accompanying plates illustrate not only the essential details but also the principal features to be observed in preparing plans for submission. These plans illustrate sewage treatment plants which are applicable for schoolhouse locations under typical Ohio conditions."

The operation of sewage treatment plants for public buildings, H. E. ADAMS (*Ohio Pub. Health Jour., 8 (1917), No. 1, pp. 29–30, figs. 2*).—Instructions as to the proper operation and maintenance of sewage-treatment plants for public and private institutions and schools are given.

The expansion and contraction of concrete and concrete roads, A. T. GOLDBECK and F. H. JACKSON, JR. (*U. S. Dept. Agr. Bul. 532 (1917), pp. 31, pls. 2, figs. 16*).—Laboratory and field tests begun in 1910 on expansion and contraction movements by concrete pavements are reported. These included data on attention to the spacing, design, and movement of expansion joints.

It was found that neat cement, when allowed to dry, first contracted rapidly, then more slowly. The amount of contraction seemed to vary with the cement, size of specimen, and condition of atmosphere in which drying took place. The amount at 28 days was about 0.1 per cent and at six months about 0.2 per cent.

Mortar contracted on hardening in air and expanded on hardening in water. The contraction in warm, dry air at 28 days was about 0.045 per cent for 1:2 and 1:3 mortar and at six months was 0.078 for 1:3 mortar and 0.085 for 1:2 mortar. The expansion in water was 0.01 per cent for 1:3 and 0.017 for 1:2 mortar at 28 days, and at six months 0.013 for 1:3 and 0.02 per cent for 1:2 mortar.

Both 1:2:4 and 1:3:6 concrete contracted on drying in warm, dry air from 0.02 to 0.04 per cent at 28 days and from 0.04 to 0.07 per cent at six months. When hardening in water an expansion of about 0.01 per cent took place at 28 days and at six months in 1:2:4 and 1:3:6 concrete. The richness of the

mix of concrete seemed to exert a small influence on the contraction; the richer the mix the greater was the change in length.

Concrete alternately wetted and dried was made to expand and contract owing to these causes. The expansion due to wetting was more rapid than the contraction on drying. The thoroughly dried specimens of concrete did not recover their original wet length when immersed. Concrete stored in the outer air and exposed to the weather did not contract to the same extent as the above-described specimens, except under very dry conditions. A waterproof covering, such as coal tar, prevented the rapid change in moisture content and greatly retarded the expansion and contraction. Reinforcement decreased but did not prevent the shrinkage and expansion of concrete due to drying, and had no effect on temperature changes.

"Reinforcement can not therefore entirely prevent cracks, but seems to distribute them and keep them small. Concrete roads are affected by both temperature and moisture. When the drainage is good and the sub-base not wet, the temperature effects seem to be most important. A wet sub-base may add to the temperature expansion by about 0.01 to 0.02 per cent. The restraining effect of friction at the base seems to be almost negligible when figuring temperature and moisture expansion and contraction. In very dry climates shrinkage due to drying must be added to contraction due to fall in temperature. A shrinkage of 0.04 per cent (0.25 in. in 50 ft.) is a safe allowance due to drying.

"Temperature at time of construction of road should be considered in designing joints. Cold-weather construction requires a full allowance for temperature expansion, and on wet sub-bases for moisture expansion also. Hot-weather construction theoretically requires no joints at all, even in wet sub-bases, as the temperature contraction exceeds the moisture expansion. However, the difficulty of keeping the cracks clear probably renders joints imperative."

Toughness of bituminous aggregates, C. S. REEVE and R. H. LEWIS (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 7, pp. 319–330, pls. 2*).—Tests of the toughness of several representative samples of various types of rock when used as aggregates in bituminous mixtures are reported, it being concluded that the toughness of bituminous aggregates in which a given bituminous material is tested will not be the same for every type of rock.

"Tests of laboratory specimens can be directly correlated with results in service. The difference in behavior of the various rock types can not be directly attributed to any of the routine physical test values of the rock, but appears to be due largely to differences in the surface character of the rock particles. While relatively soft or fluid bitumens may yield satisfactory results in bituminous concrete with some types of rock, their use with other types will lead to failure of the road surface. The impact or toughness test of bituminous aggregates offers possibilities as a means of determining in advance the relative behavior in service of bituminous concretes. While the authors at this time have no definite recommendations to offer with regard to their last conclusion, it may be stated that further experiments will be made with that end in view."

Concrete culverts (*Cement and Engin. News, 29 (1917), No. 4, pp. 109, 110, figs. 4*).—Comparative cost data on cast-iron and reinforced concrete culvert pipe for road use are given, showing in general the economy of the latter type of construction.

Mechanical properties of woods grown in the United States, J. A. NEWLIN and T. R. C. WILSON (*U. S. Dept. Agr. Bul. 556 (1917), pp. 47, pls. 3*).—This bulletin reports the results of about 130,000 tests on the mechanical properties of woods, including data on both green and air-dry timber. A glossary of terms

used and a list of formulas used in computing are also given, together with a list of publications and papers dealing with the mechanical properties of timber.

The seasoning of wood, H. S. BETTS (*U. S. Dept. Agr. Bul. 552 (1917), pp. 28, pls. 8, figs. 18*).—This bulletin enumerates the injuries to wood in seasoning, as checking, casehardening, honey-combing, warping, and collapse, and describes the processes of air seasoning and kiln-drying. Tabular and graphic data are given on the average weights and shrinkages of various species of wood and the rate at which crossties, poles, and sawed timbers of several species lose moisture when freely exposed to the atmosphere.

Creosoting for estate purposes, W. P. GREENFIELD (*Quart. Jour. Forestry, 11 (1917), No. 2, pp. 94–111*).—The use of creosote as a preservative for farm and estate structural timber is discussed.

[Farm machinery directory] (*Farm Machinery, No. 1342 (1917), pp. 20–24*).—This directory lists the specifications for 188 internal-combustion tractors, 129 plows for tractor use, 23 huskers and shredders, and 104 silo fillers.

Public tests of motor cultivation at Avignon, E. ZACHAREWICZ (*Prog. Agr et Vit. (Ed. l'Est-Centre), 37 (1916), No. 31, pp. 109–115*).—Tests of six tractors on breaking and deep plowing of loose alluvial soil are reported. The soil was dry and rather tenacious. The following table gives the results on breaking:

Tests on soil breaking.

Horsepower.	Depth of plowing.	Width of plowing.	Area plowed.	Duration of test.		Fuel consumption.
	Cm.	*Meters.*	*Sq. meters.*	*Hr.*	*Min.*	*Liters.*
12-20	11	1.00	9,630	2	51	26.00
12-24	10	1.15	9,422	2	49	21.50
8-16	10	.90	9,240	3	5	22.70
8-16	12	1.15	9,108	2	6	15.72
10-20	8	1.30	9,600	3	5	17.50
12-25	12	1.60	10,060	2	22	18.40

The following table gives the results on deep plowing:

Tests on deep plowing.

Horsepower.	Depth of plowing.	Width of plowing.	Area plowed.	Duration of test.		Fuel consumption.
	Cm.	*Meters.*	*Sq. meters.*	*Hr.*	*Min.*	*Liters.*
12-20	20	1.00	9,548	3	25	30.0
12-24	20	1.15	9,525	0	0	30.0
8-16	20	.90	9,240	4	3	35.0
8-16	20	.65	11,220	4	0	31.2
10-20	20	.70	9,600	4	12	36.4
12-25	21	1.15	10,400	3	47	30.5

Tractor specifications, 1917 (*N. G. E. A. Bul., 2 (1917), No. 10, pp. 27; abs. in Gas Engine, 19 (1917), No. 6, p. 278*).—Detailed specifications for 95 different tractors are given.

Note on fencing construction, T. GILBERT (*Dept. Agr. Bombay Bul. 81 (1916), pp. 3, pls. 8*).—This bulletin describes briefly a few practical points to be observed when erecting wire fences with wooden posts, with special reference to conditions in India.

Dairy and general-purpose barns, F. M. WHITE (*Nat. Lumber Manfrs. Assoc. Trade Ext. Dept. Farm Bul. 7 (1917), pp. 40, figs. 31*).—This bulletin deals with site and location, general shapes, light, ventilation, stalls, floors, and feed alleys

...ry and general-purpose barns and gives details of construction. Diagram... illustrations of six types of barns are included.

Barns for work animals, B. YOUNGBLOOD (*Texas Sta. Bul. 210 (1917), pp. 3-28, figs. 18*).—It is stated that "satisfactory barns, large enough only for the work stock and a year's supply of feeding stuff, can be constructed in Texas at a cost of from $25 to $50 per animal. If as much as from $100 to $300 per animal is put into the barn, a proportionate amount of extra storage space for additional hay, grain, seeds, and so forth, may be had at less additional cost than would be the case if a separate storage building were constructed."

Suggestive plans are given which demonstrate principles applicable to Texas conditions. These are to be modified to meet local conditions. "The plans given begin with the cheapest possible, and end with a moderate-priced structure. The chief difference is in the size, convenience in feeding, and the amount of extra storage space supplied. No general-purpose barn plans are given, for the reason that it is better under southern conditions to have special-purpose buildings, separate and apart."

Bills of material and lumber necessary for the construction of various sized barns for work animals are also included.

Measuring silage and capacity of silos, L. W. CHASE (*Nebraska Sta. Circ. 1 (1917), pp. 14, figs. 5*).—As the result of silage weighing experiments a new table of weights of silage is proposed for determining the capacities of silos, the rule for which assumes that silage settles 10 per cent after filling ceases. A comparison of the new weights with those established by King at the Wisconsin Station shows that the new weights are from 11.5 to 13 per cent less than the Wisconsin weights. The new table of weights was found to be very nearly correct on the basis of actual weighing, being if anything a fraction too large.

The proposed weights are given in the following table:

Weight of silage per cubic foot.

Depth of silage.	Weight per cubic foot.	Depth of silage.	Weight per cubic foot.	Depth of silage.	Weight per cubic foot.	Depth of silage.	Weight per cubic foot.
Feet.	*Lbs.*	*Feet.*	*Lbs.*	*Feet.*	*Lbs.*	*Feet.*	*Lbs.*
1	16.13	14	25.24	27	32.91	39	38.48
2	16.89	15	25.88	28	33.43	40	38.88
3	17.54	16	26.52	29	33.94	41	39.27
4	18.38	17	27.15	30	34.44	42	39.65
5	19.12	18	27.77	31	34.93	43	40.02
6	19.83	19	28.38	32	35.41	44	40.39
7	20.54	20	28.99	33	35.88	45	40.75
8	21.24	21	29.58	34	36.34	46	41.11
9	21.93	22	30.16	35	36.79	47	41.46
10	22.61	23	30.73	36	37.23	48	41.81
11	23.28	24	31.29	37	37.65	49	42.16
12	23.94	25	31.84	38	38.07	50	42.50
13	24.59	26	32.38				

Tables are also given showing the relative capacities of silos and estimated tonnage of silage by volume, together with information regarding the determination of silo capacities. The experimental results on which the tables are based are included.

Poultry houses and poultry equipment for Texas, R. N. HARVEY, J. C. OLSEN, F. W. KAZMEIER, and T. J. CONWAY (*Texas Sta. Bul. 207 (1917), pp. 23, figs. 17*).—Plans of poultry houses and equipment are given and discussed, which, it is stated, with modifications of structure to fulfill needs imposed by climatic conditions may be used satisfactorily in almost any locality.

RURAL ECONOMICS.

The farmers' handbook, compiled by P. G. GILDER (*Sydney, N. S. Wales: Dept. Agr., 1916, 2. ed., pp. VI+886, pls. 5, figs. 443*).—This handbook is written for the use of practical farmers as well as a textbook for agricultural colleges, and high schools in New South Wales, and covers the entire field of agriculture with the exception of live stock, which subject is to be treated in a separate volume. The text is profusely illustrated.

The Federal Office of Markets and Rural Organization, J. C. GILBERT (*Agr. of Mass., 1916, pp. 109–121*).—The author describes the various activities of the Office of Markets and Rural Organization of the U. S. Department of Agriculture, as well as the marketing activities carried on through State bureaus and colleges of agriculture.

Functions of a State bureau of markets, A. E. CANCE (*Agr. of Mass., 1916, pp. 122–134*).—The author discusses the field to be covered by the State bureau, as well as the State agricultural colleges, and calls attention to conditions in the various States.

Cooperative purchasing and marketing organizations among farmers in the United States, O. B. JESNESS and W. H. KEER (*U. S. Dept. Agr. Bul. 547 (1917), pp. 82, pls. 15*).—The authors discuss the early history and growth of cooperative organization, different types of organizations and their characteristics, cooperation in representative States, representative types of cooperative organizations, and agencies which assist farmers in organizing. Statistical data are given showing the number of farm organizations, volume of business, and membership. There is also a brief digest of State cooperative laws and the text of a portion of the Clayton Amendment to the United States antitrust laws. A selected list of publications on cooperative purchasing and marketing is appended.

The county farm bureau, B. H. CROCHERON (*California Sta. Circ. 166 (1917), pp. 16, figs. 12*).—The author points out the functions of the farm bureau, general plans of organization, methods of handling demonstrations, etc. He also includes a model constitution and by-laws.

List of county and local agricultural societies, L. H. WIBLE (*Penn. Dept. Agr. Bul. 296 (1917), pp. 9*).—This bulletin contains a list of local agricultural and horticultural societies, with dates of fairs to be held in Pennsylvania in 1917, information regarding attendance in 1916, receipts, premiums, etc.

Cooperative credit for the United States, H. W. WOLFF (*New York: Sturgis & Walton Co., 1917, pp. V+349*).—The author has endeavored to describe the cooperative credit organizations existing in the various European countries, with reference to their adaptability to conditions in the United States.

A survey of insurance of damage by fire to crops and forests, E. VIDIEBE (*Précis D'expertises Après Incendies des Récoltes et des Bois. Paris: Libr. Agr. Maison Rustique, [1916], pp. VII+484, pl. 5, figs. 18*).—This report discusses, for France, the extent of the damage and methods of measuring the loss or destruction by fire of various types of crops, live stock, and forests.

The Torrens system of land title registration, F. B. BOMBERGER (*Md. Agr. Col. Bul., 14 (1917), No. 2, pp. 8*).—This contains a brief review of the history of the Torrens system and of its principal provisions.

[Italian rules governing agriculture], D. F. WILBER (*U. S. Dept. Com., Com. Rpts., No. 181 (1917), pp. 460–463*).—These pages contain parts of the decrees relating to agrarian contracts, the general use of agricultural machines, and the selection of agricultural committees and arbitrating committees for judicial districts.

Rural index, H. L. HOLLISTER (*Chicago: Author, 1917 ed., pp. [23], pl. 1, figs. 3*).—This volume outlines a system for numbering rural homes so that they may be located as readily as city homes are by their street number.

Pounds to bushels tables, E. D. DAVIS (*Minneapolis, Minn.: Author, 1916, pp. 40*).—Tables are given for reducing pounds to bushels for oats, barley, buckwheat, shelled corn, ear corn, rye, flax seed, wheat, peas, beans, clover seed, and potatoes. Instructions are also given for determining the value of a load of grain, measuring the contents of bins, etc., measuring ear corn in a crib, measuring coal in a shed, computing freight rates per bushel from freight rates per hundred, estimating the value of mixed feeds, and loading cars by measurement.

Marketing grain at country points, G. LIVINGSTON and K. B. SEEDS (*U. S. Dept. Agr. Bul. 558 (1917), pp. 44, figs. 4*).—Among the conclusions brought out by the authors are the following:

"Price and other factors being equal, farmers should patronize houses remaining open throughout the entire year.

"The producer of high-quality grain often receives less than it is worth in order that an equal price may be paid to a grower of grain of inferior quality. The farmer who delivers clean, dry, sound grain should receive a premium over the price paid to his more careless competitor. Farmers who deliver grain of inferior quality should be willing to submit to a discount. . . . It is likely that the standardization of grain produced in a community would not only result in a reputation for uniform quality which at times may command a premium over general market prices, but also reduce the cost of handling grain through the local elevator.

"While the 'scoop-shoveler' is usually a disturbing element, often causing loss to farmers and others having business relations with him, it is undoubtedly true that he frequently acts as a restraining influence upon the country dealer.

"Contracts with farmers for future delivery of grain should be entered into only after the interests of both parties concerned are safeguarded by a written contract clearly and concisely setting forth all the details of agreement. . . .

"When many elevators serve a community bad practices are usually introduced into the business, which increase the cost of marketing the farmer's grain and depreciate the value of all houses in the town and surrounding territory. Cooperative associations, as well as independent dealers, who desire to enter the business should purchase existing plants if this is practicable rather than build new ones.

"Losses from shrinkage and overgrading are usually ignored by country elevators. Managers should maintain a system of bookkeeping which shows accurately these as well as all other expenses, and a study of the results obtained should enable them to conduct their business in an economic and profitable manner. . . .

"When the organization of a cooperative-elevator association is contemplated, careful consideration should be given to the needs of the community for additional marketing facilities. Usually it is unwise to place too much confidence in the statements made by outsiders regarding the profits to be derived and the cost of operating a country elevator. Farmers should investigate fully the business circumstances which are to surround the new enterprise before affiliating themselves with the proposed cooperative-elevator association."

Farm labor [conditions in Canada] (*Agr. Gaz. Canada, 4 (1917), No. 5, pp. 387–393*).—These pages contain a series of articles indicating the plans adopted in a number of Provinces for the purpose of securing farm help necessary at the various seasons of production.

Labor conditions among the forest workers in Sweden, G. HUSS (*Sveriges Off. Statis., K. Soc. Styr., 1916, pp. 599, figs. 66*).—This is a review of the social and labor conditions, wages, and hours of lumbermen and others employed in the forests of the Värmland, Dalarna, and Norrland regions of Sweden.

Notes on methods and costs, California crop production, R. L. ADAMS (*Berkeley, Cal.: Univ. Cal., [1917], pp. [7]+140*).—This volume contains data showing the requirements and methods of growing and cost of production of the various crops in that State. The statements are based upon the present practice of commercial producers, and are not designed to indicate what should be done but rather what is being done by men specializing in these crops. It also contains data concerning work capacity of farm machines, rules for determining work of implements, a day's work per man, a day's work per crew, annual amount of work required to care for live stock, costs of building materials, costs of fencing, costs of farm implements, costs of miscellaneous equipment, and annual rate of depreciation of farm machinery.

Meeting the food crisis, A. M. SOULE (*Atlanta, Ga.: South. Bell Telephone & Telegraph Co., 1917, pp. 19*).—In this speech the author discusses the deficit in food crop in Georgia, and the increase necessary to enable the State to feed itself. He also points out methods that may be used to obtain the necessary increase.

The food supply in New England, E. F. MCSWEENEY (*Boston, Mass.: New England Federation for Rural Prog., 1917, pp. 14*).—The author discusses the changes in the system of farming in New England, its effect upon the food supply, and some methods that may be adopted to improve it.

The food supply of the United Kingdom (*London: Bd. Trade, 1917, pp 35*).—This report, drawn up by a committee of the Royal Society of London, discusses the food supply in the period of 1909–1913, the proportion of home produce and imported products used, the quantities of various classes of food used during 1916, the ration for the civil and military population, and possible methods of economizing the available food supply. The suggestions given include a better recovery of flour in milling, increase of economy in meat production, increase in the protein available for human consumption by increasing the manufacture of cheese at the expense of butter making, use as food of materials at present employed in brewing and distilling, and the diverting of food now used as feed for stock to use for human food.

Production of food in Scotland, E. WASON ET AL. (*Scot. Dept. Com. on Food Prod. Rpt., 2 (1916), pp. 6*).—This report discusses the land available for increased food production, methods of increasing labor supply, manures, and implements.

[Increasing agricultural production in France], H. HITIER (*Bul. Soc. Encour. Indus. Nat. [Paris], 116 (1917), I, No. 3, pp. 582–594*).—This article outlines the extent of the agricultural production in France, compares it with conditions in other countries, suggests methods of making agriculture more intensive, and gives recommendations adopted by the National Association of Economic Expansion with reference to the expansion of production.

The wheat question, PERCHOT (*Vie Agr. et Rurale, 7 (1917), No. 25, pp. 433–440*).—The author points out the available home supply of wheat and the possibilities of increasing it, the influence of Government intervention through price fixing and the guaranteeing of price, and the influence of price on production.

Food crisis in Portugal (*Bol. Assoc. Cent. Agr. Portuguesa, 19 (1917), No. 7, pp. 217–224*).—These pages outline methods that may be used to increase the production of cereals, sugar, cotton and other fibers, oil seeds, horticultural products, and live stock.

[**Agricultural development in Navarra**], D. NAGORE Y NAGORE (*Servicio de Agricultura y Ganaderia. Pamplona, Spain: Prov. Printer, 1917, pp. 43*).—In this report are discussed the various types of agricultural organizations found, types of agricultural machines used and difficulties encountered in introducing new machines, natural products in Navarra, agricultural practices in different communities, and kinds of live stock and extent of live stock production.

Some observation on agricultural work in Egypt, Britain, America, and Japan. W. ROBERTS (*Lahore, India: Govt., 1917, pp. 12+XVIII*).—This report deals with the methods of growing cotton in the countries named, and schools and educational methods used for teaching the best practices.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 3 (1917), No. 8, pp. 69–80, fig. 1*).—This number contains the usual data relating to crop conditions, estimated farm value, average prices received by producers, and range of prices of agricultural products at important markets. It also includes special reports on the monthly marketings of wheat by farmers, production of sugar in the Philippine Islands, the acreage of beans by varieties, acreage of corn, peas, tomatoes, and snap beans contracted for by canners, and crop conditions in Florida and California, as well as on silos in the United States, fertilizers used on cotton, index numbers of food supplies in various countries, manufacture of vegetable oils for edible purposes, percentage and index number of foodstuffs in the export and import trade of the United States, data showing when farmers sell their crops, etc.

[**Agricultural statistics of Indiana**] (*Bien. Rpt. Bur. Statis. Ind., 16 (1915–16), pp. 444–446, 543–547, and 564–662*).—These pages contain data relating to the rural population, the increase of farm land, the assessed value of farm land, climatology, crops, and live stock. These data are based upon reports obtained by the township assessors.

Agricultural statistics for Wisconsin, 1915 and 1916 (*Wis. Dept. Agr. Bul. 11 (1917), pp. 145–192*).—This report contains statistical data, showing for 1916, by counties, the acreage, production, yield per acre, and area of the principal crops; number and value of live stock; number of silos; and average farm prices of important farm products on December 1, 1916.

Annual statistical report of the New York Produce Exchange for the year 1916 (*Ann. Statis. Rpt. N. Y. Produce Ex., 1916, pp. 139*).—This volume contains data relating to the receipts and exports of agricultural products from New York City, together with daily prices, freight rates, and the production of crops of the United States and in foreign countries for 1916, with comparative data for earlier years.

[**Agriculture in Norway**] (*Statis. Aarbok Konger. Norge, 36 (1916), pp. 24–35*).—These pages supplement data previously noted (E. S. R., 37, p. 93), by additional statistics for the year 1916.

Returns of produce of crops in Scotland (*Agr. Statis. Scotland, 4 (1915), pt. 2, pp. 59–79*).—These pages continue data previously noted (E. S. R., 33, p. 894) by adding statistics for a later year.

[**Agricultural statistics of British India for the year 1915–16**], G. F. SHIRRAS (*Agr. Statis. Brit. India, 1915–16, pp. 11*).—This report contains data by Provinces, showing the area cultivated and uncultivated in 1916 with comparative data for earlier years, area under irrigation, area under different crops, number of live stock, plows and carts, number of transfers of property and area transferred, together with area assessed, and incidents of land revenue settlement.

Live stock statistics (*Internat. Inst. Agr. Rome, Internat. Crop Rpt. and Agr. Statis., 8 (1917), No. 5, pp. 390–392*).—Data are shown indicating the num-

ber of the various classes of live stock in France on December 31, 1916, July 1, 1916, November 1, 1915, and December 1, 1915, together with similar data for Cuba for the second half year of 1915 and of 1916.

AGRICULTURAL EDUCATION.

Agricultural education and research (*Rpt. Bd. Agr. Scot., 5 (1916), pp. XII–XVIII*).—An account is given of the progress made in 1916 in the agricultural education and research work under the control of the Board of Agriculture of Scotland.

Annual report of the director of the elementary agricultural education division, New Brunswick, 1916, R. P. STEEVES (*Dept. Agr. New Brunswick, Ann. Rpt. Dir. Elem. Agr. Ed. Div., 1916, pp. 26, pls. 2, figs. 2*).—This is a report on the progress made during the year in instruction in nature study and elementary agriculture, and the training of teachers in these subjects, including some of the difficulties encountered in the work.

During the year, 78 schools received grants for instruction in nature study and elementary agriculture with school gardening, an increase of 23 over the previous year. The number of school children receiving regular instruction in these subjects increased over 1,000, and the number of home plats, varying from ¼ acre to a few square feet each, from 378 to 727. The publication of a rural education monthly for the schools was begun to call attention to rural problems, to deepen interest in country life, etc.

[Agricultural instruction in Ontario, 1916], W. H. HEARST (*Rpt. Min. Agr. Ontario, 1916, pp. 5–20, 28–34, 46–77, figs. 25*).—This report contains information for 1916 similar to that given for 1914 (E. S. R., 34, p. 597). The number of school fairs held increased from 234 in 1915 to 275 in 1916, the number of children taking part from 48,386 to 60,262, and the number of home plats from 51,243 to 55,947. Among new features introduced in this work are interschool live-stock judging competitions and weed naming and driving contests. Public speaking contests are now recognized as an important feature of a school fair.

Ultuna agricultural institute and farm, 1916 (*Upsala, Sweden: Ultuna Landtbr. Inst., 1916, pp. 32, pl. 1, figs. 12*).—A report on the history, development, and present organization of the instruction and experimental work of this institution.

Agricultural education in Bulgaria, D. I. MURPHY (*U. S. Dept. Com., Com. Rpts., No. 110 (1917), pp. 554, 555*).—A brief statement is given concerning the course of study, cost, and entrance requirements of the agricultural schools at Roustchouk, Sadovo, Pleven, and Orhanie, the latter for girls, and of eight agricultural schools of lower grade.

[Rural education] (*Education, 37 (1917), No. 9, pp. 541–589*).—The principal addresses given at the Fifth Annual Conference on Rural Education held at Worcester, Mass., in March, 1917, are presented as follows: The New Conception of the Rural School Problem, by William B. Aspinwall; A Rational Program for Rural Education, by Payson Smith; How the Curriculum May Better Meet Present Day Social Needs, by William D. Hurd; Vitalizing School Studies—the Situation in One Massachusetts Town, by Mrs. Ella M. Clark; Vitalizing a Rural School Course, by Allen S. Woodward; The Revitalized Course of Study, by J. C. Muerman; Vitalizing Rural School Work in Massachusetts, by Grace C. Smith; An Example of a "Vitalized" School, by M. Harriet Bishop; and First Aid to the Citizen Makers, by Joseph D. Eggleston.

The school inspector and rural science, E. ROBINSON ET AL. (*Agr. Gaz. Canada, 4 (1917), Nos. 6, pp. 499–507; 7, pp. 608–610*).—This is a series of brief

articles by school inspectors in Nova Scotia, Ontario, and Saskatchewan on what the school inspector can do to promote rural science instruction in the schools.

The agricultural subjects, W. A. BROYLES (*Quart. Jour. Univ. N. Dak., 6 (1916), No. 2, pp. 138–144*).—The author discusses the wide range of the field of agricultural subjects, their cultural value, and elements of live educative processes in and out of school.

"Snap courses" in college: Agriculture v. engineering, F. H. BLODGETT (*School and Soc., 6 (1917), No. 135, pp. 91–96*).—The author presents an analysis of the two fields of agriculture and engineering in an effort to discover why the biological sciences are so often regarded as "snap courses" in the average college. In his opinion, "It seems probable that the disrespect so often felt by students, either for the courses in the biological sciences themselves, or for the students who select such courses, will be largely diminished if there can be developed a more definite goal toward which the whole body of teaching and experiment may converge, each step being coordinated with each other step, and each essential to the whole. It should be the aim of agricultural science (or of biological science, of which agriculture is the field of application), to discover the sequence of details which together are necessary to build a foundation for the growth of the subject for its development into a branch of knowledge coordinate with the older topics."

Outline of experiments for departments of agriculture in the public schools of Louisiana, P. L. GUILBEAU and T. H. HARRIS (*Baton Rouge, La.: Dept. Ed., pp. 53, fig. 1*).—The author outlines exercises and experiments in agriculture to be used in connection with the various texts studied in grades 8, 9, and 11 of the public schools of Louisiana.

Dairy education, R. A. PEARSON (*Lincoln, Nebr.: Univ. Nebr., 1917, pp. 12*).—In this address, delivered at the dedication of Dairy Industry Hall at the University of Nebraska on January 17, 1917, the author discusses the growth of the dairy industry, the development of dairy cattle, improvements in methods of dairying, the recognition by the American people of the importance of making ample provision for instruction in the fundamental and vital industries of this country, the dignity of agricultural education, and future problems in dairying.

The present position and future developments of dairy education.—Science, J. MACKINTOSH (*Jour. Brit. Dairy Farmers' Assoc., 31 (1917), pp. 92–107, fig. 1*).—The author gives a concise account of the system of dairy education which has been developed in Great Britain. This comprises instruction (1) provided by counties in the form of itinerant instruction and instruction at a fixed institution, either a county farm school or an agricultural college, or both, and (2) at provincial institutions. The most necessary lines of future development are also indicated.

The present position and future developments of dairy education.—Practice, P. MCCONNELL (*Jour. Brit. Dairy Farmers' Assoc., 31 (1917), pp. 85–91*).—This is a review of progress made in practical dairy instruction in Great Britain, with special reference to feeding, records, selection, sanitation, and inspection. In the author's opinion "the best equipped dairy farmer—apart from questions of capital—is one who has spent some time in his youth on a dairy farm, taking his share of the work . . . and who then, equipped with practical knowledge, attends the usual courses at a dairy school."

The part which women might play, MARGARET SHANKS (*Jour. Brit. Dairy Farmers' Assoc., 31 (1917), pp. 108–118*).—This is a review of what women have done in dairy production in the past and the lines upon which they have been advancing in recent years, and a consideration of what additional or special

help they could give in the effort to increase the dairy production of Britain. The latter, the author concludes, "is a question first of education: Grades of education to suit the different classes of women who engage in dairying and, above all, an education that will come right into the farmhouse and influence the minds of the wives and daughters there. . . . And, added to that, let them have equal and honorable place beside men in all associations that concern the welfare of the industry in which they both labor with head and hands."

Productive dairying, R. M. WASHBURN (*Philadelphia and London: J. B. Lippincott Co., 1917, pp. XII+432, pls. 2, figs. 120*).—The object of this book is to furnish a foundation and guide for good practice in dairying. It is written for use in high schools, schools and colleges of agriculture, general courses, rural consolidated schools, and farmers. Its seven parts deal respectively with the why of dairying, the dairy breeds, care and management of dairy cows, winter feeding, clean milk production, farm dairying, and market milk. Tables showing the composition of feeding stuffs and data as to fat estimation are appended.

A first-year course in home economics for southern agricultural schools, LOUISE STANLEY (*U. S. Dept. Agr. Bul. 540 (1917), pp. 58, figs. 2*).—This bulletin outlines a first-year course in home economics, consisting of 160 lessons in cooking and sewing with related hygiene and sanitation, for southern agricultural schools. It emphasizes the connection between such instruction and actual home experience, discusses methods of teaching, and offers suggestions for correlating the work with other school subjects. A list of publications of this Department of interest in connection with this bulletin is appended.

The story of foods, F. CRISSEY (*New York and Chicago: Rand McNally & Co., 1917, pp. 501, figs. 271*).—This book gives a comprehensive world view of foods and their geographical and industrial background. It deals especially with the human agencies concerned in the production, preparation, and distribution of foods, including the work of the wholesaler and retailer. The foods dealt with are the grains, fruits, vegetables, dairy products, honey, poultry, meat, fish, canned and condensed foods, dried fruits, coffee, tea, and other drinks, nuts, sugar, spices, salt, and table delicacies.

Elements of the theory and practice of cookery, MARY E. WILLIAMS and KATHARINE R. FISHER (*New York: The Macmillan Co., 1916, 2. ed., rev. and enl., pp. XIII+405, pls. 16, figs. 30*).—This is the second edition, revised and enlarged, of a text in domestic science which may be used for individual or group instruction, and the subject matter of which can be covered in four terms of two school years by pupils in the sixth and seventh, or seventh and eighth grades of school, one two-hour lesson being given each week. The book deals with the following topics, taken up in an order that experience has shown to be natural and convenient: Homes and home-making; some starchy plants; tissue-building foods; bread; food in its relation to life; meat, fish, and poultry; fuel foods; fruits and vegetables; sugar and sweets; the preservation of food; special dietaries; tea, coffee, cocoa; the serving of food; laundering; and digestion. Principles are taught in connection with their application, followed by a classification of foods, their chief constituents, economic and food values, etc. Bibliographies are added.

Wool: The raw materials of the woolen and worsted industries, S. H. HART edited by F. W. FRANCE (*Philadelphia: The Philadelphia Textile School, 1917, pp. XX+228, pl. 1, figs. 91*).—This book has been prepared for use as a text in connection with the course in the raw materials of the wool industries at The Philadelphia Textile School. It makes an effort to follow the various raw materials of the woolen and worsted industry from their origin to the point where

actual machine processing begins, and comprises the following chapters: Structure, properties, and characteristics of wool; classes of fleece wool, including brief descriptions of important long and medium-wool breeds of sheep; grading and sorting; shrinkage; shearing, preparing, and marketing wool; pulled wools; mohair and other textile hair fibers; wool substitutes and waste products; fabric requirements; and historical synopsis. Statistics of wool production and importation in the United States, distribution of sheep, score cards for sheep, and other useful data are appended.

[Conference of the Alabama Home Economics Association] (*Ala. Girls Tech. Inst. Bul., n. ser., No. 38 (1916), pp. 37*).—This bulletin contains the following addresses given at the second annual conference of the Alabama Home Economics Association held at the Alabama Girls' Technical Institute, Montevallo, January 27–29, 1916: Home Economics in the New and Socialized Curriculum, by Z. Judd; Vocational Phases of Household Arts Education, and Survey of Household Economics in the High School, by Mary S. Woolman; and Club Work for Women and Girls; and a round table discussion of What Has Been Done in Home Economics in Alabama during 1915, including an outline of a suggested four-year course in home economics in the high schools of Alabama.

Report of the supervisor of women's institutes, HAZEL E. WINTER (*Rpt. Agr. New Brunswick, 1916, pp. 51–55*).—This is a report on the growth, patriotic work, short courses, and the fourth annual convention of the women's institutes of the Province of New Brunswick.

MISCELLANEOUS.

Monthly Bulletin of the Ohio Agricultural Experiment Station (*Mo. Bul. Ohio Sta., 2 (1917), Nos. 7, pp. 211–247, figs. 21; 8, pp. 249–281, figs. 14*).—These numbers contain, in addition to several articles abstracted elsewhere in this issue and miscellaneous notes, the following:

No. 7.—Buckwheat Culture.—A Bread-making Grain Commanding Unusual Attention this Year, by C. G. Williams; Wheat-flour substitutes.—Rolled Oats, Corn Meal, and Buckwheat Flour Provide Cheaper Food, by Mabel K. Corbould; Diseases of Wheat.—Methods of Control Possible by Seed Treatment, by A. D. Selby; Grain-bin Sanitation.—Insect Injuries to Stored Cereals Prevented by Cleaning Bins, by W. H. Goodwin; Silage for Fattening Cattle.—Economy in Winter Feeding Results, Experiment Proves, by B. E. Carmichael; Thinning Fruit.—Greater Yields of High Quality Result from Removing Part of Crop, by W. J. Green; and Insect Pests of Vegetables.—Methods of Control Suggested for the More Troublesome Kinds, by J. S. Houser.

No. 8.—Harvesting Soy Beans.—Special Care Needed in Cutting and Curing the Crop, by C. G. Williams, an extract from Bulletin 312 (E. S. R., 37, p. 235); Late Blight of Potatoes.—Weather Conditions May Necessitate Continued, Thorough Spraying, by D. C. Babcock; and Fuel and the Woodlot.—Marketing Wood Provides Winter Labor and Improves Timber Areas, by E. Secrest.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West Wash. Sta., Mo. Bul., 5 (1917), No. 5, pp. 62–76, figs. 4*).—This number contains brief articles on the following subjects: Use of Soiling Crops, by H. L. Blanchard; Eradication of Rootstock Weeds, by E. B. Stookey; A Commercial Poultry Plant, by G. R. Shoup; Agricultural Fair Exhibits; Mountain Beavers; and Farmers' Excursions.

NOTES.

Connecticut College and Stations.—The legislature has authorized the trustees of the college to establish at least two scholarships from each county, and appropriated $4,000 for the purpose for the period ending September 30, 1919. The legislature also provided for State aid to one corporation or association organized in each county for the purpose of providing instruction and practical demonstration in agriculture and home economics, promoting advanced business methods among farmers, or assisting in any manner in the development of agriculture and the improvement of country life. Each organization may obtain annually from the State an amount equal to the sum received by it otherwise than under the provisions of the Federal Agricultural Extension Act, but not less than $1,000.

The chemical laboratory, occupied by the college and Storrs Station, was totally destroyed by fire, November 26, 1917. The apparatus and chemical laboratory of the station were destroyed, together with a large part of the samples of experimental crops which were awaiting analysis. The chemical work of the station is for the present being carried on at the State Station at New Haven.

John P. Street, chemist in charge of the analytical laboratory at the State station, has been granted leave of absence to become captain in the Sanitary Corps of the National Army. His duties are expected to deal largely with problems regarding the food supply at the cantonments. Waldo L. Adams, chemist, resigned December 1 to accept a commercial position.

Purdue University and Station.—A tract of 385 acres of virgin forest land in Randolph County has been given the university by the late Mrs. Henry Davis. Under the terms of the will the property is to be maintained as the Henry Davis Forestry Farm. The forest must be preserved and no commercial cuttings made, the tract used as a refuge for song birds, and experiments undertaken for the acclimatization of useful plants.

H. J. Reed, associate horticulturist, has been appointed assistant to the director. George N. Hoffer, assistant professor of botany in the school of science, has been transferred to the station as associate in botany, his college work being assumed by Eben H. Toole of the Kansas College. R. B. Easson, assistant in the poultry extension department, has resigned to enter a reserve officers' training camp, and H. C. Mills, associate in dairy manufactures, has resigned to engage in commercial work.

Kentucky University and Station.—Thomas P. Cooper, director of station and extension work in North Dakota, has been appointed dean of the college of agriculture and director of the station beginning January 1, 1918. R. H. Wilkins and L. B. Mann, of the animal husbandry department, have resigned. Recent appointments include J. R. Humphrey of the U. S. Department of Agriculture as head of the department of markets, and J. H. Martin, T. G. Yaxis, and H. C. Rhodes as assistants in animal husbandry.

Minnesota University and Station.—Dr. E. Dana Durand has resigned as chief of the division of research in agricultural economics to devote his entire attention to work in the college of science, literature, and arts. George E.

Holm, research assistant in agricultural biochemistry, has been commissioned first lieutenant in the Sanitary Corps of the Army Medical Department, and is expected to be assigned to investigations in the Gas Defense Service. G. R. McDole, assistant in soils, has enlisted in the Sanitary Corps for duty in the Gas and Flame Service.

F. L. Washburn has been transferred from professor of entomology in the college of agriculture, entomologist in the station, and State entomologist, to become professor of economic vertebrate zoolgy beginning February 6. Dr. C. C. Palmer, professor of physiology in the division of veterinary medicine, has accepted an appointment as professor of bacteriology, physiology, and hygiene at the Delaware College. Shinjiro Sato, assistant in agricultural biochemistry, has resigned to return to Japan.

Recent appointments include G. E. Weaver as assistant professor of dairy husbandry and assistant dairy husbandman, H. R. Searles as instructor in dairy production, and Paul L. Miller as superintendent of the Morris school of agriculture and substation, vice E. C. Higbie resigned.

Missouri University and Station.—M. F. Miller has been appointed assistant dean and director beginning November 1, 1917. Other appointments include Dr. O. S. Crisler as superintendent of the serum production work in the department of veterinary science, W. L. Nelson as assistant in the agricultural extension service, Frank L. Wright as assistant in boys' and girls' club work, L. L. Alexander as instructor in farm crops, Dr. C. H. Hays as extension assistant professor of veterinary science in charge of hog cholera extension work, Bliss F. Dana, M. H. Fohrman, and Turner H. Hopper as assistants in horticulture, dairy husbandry, and agricultural chemistry, respectively, Clifton R. Thomson, S. R. Miles, and I. F. Nuckols as assistants in animal husbandry, and E. H. Hughes as assistant to the dean and director and superintendent of short courses. R. R. Hudelson, assistant professor of soils, has been commissioned first lieutenant in artillery, E. M. McDonald, assistant professor in farm crops, as second lieutenant in infantry, and O. R. Johnson, professor of farm management, and F. C. Fenton, extension assistant in agricultural engineering, as second lieutenants in artillery. V. F. Payne, instructor in agricultural chemistry, resigned October 5.

Nebraska University and Station.—The corner stone of the new agricultural engineering building has been laid and it is expected that the building will be ready for occupancy next fall. Reinforced concrete construction has been substituted for steel in the new plans. Plans are also being drawn for a veterinary building, which it is hoped to erect in the spring.

H. B. Pier, assistant professor in animal husbandry, has resigned. H. W. Thurston, jr., has been appointed associate professor of plant pathology, vice G. K. K. Link on leave of absence from November 1, 1917, to take up special work with the U. S. Department of Agriculture. F. E. Mussehl, of the Wisconsin University and Station, has been appointed professor of poultry husbandry, vice M. E. Dickson resigned, effective October 20. R. P. Crawford has succeeded Floyd Wambeam, resigned, as agricultural editor. William B. Nevens, assistant dairy husbandman of the Illinois Station, has been appointed assistant professor of dairy husbandry. Miss Alice Loomis and Mrs. Emma R. Davisson have been granted leave of absence for the academic year, the former to take up work with the U. S. Bureau of Education and the latter to engage in extension work for the States Relations Service.

Nevada Station.—James B. McNair has resigned as assistant chemist, effective January 1, 1918. J. B. Menardi, assistant agronomist, has enlisted in the U. S. Navy.

Cornell University.—The college of agriculture has been assigned by the State Vocational Education Board the task of training teachers of agriculture and directors and supervisors of agricultural subjects. The training of teachers of home economics is to be divided between the college, the State Teachers' College at Albany, and the State Normal School at Buffalo. It is expected that eventually about $75,000 of the Federal funds will be available to the college annually, and that considerable graduate work will be developed by the department of rural education.

D. B. Carrick has resigned as instructor in pomology to accept a position in the Bureau of Markets of the U. S. Department of Agriculture.

Oregon College and Station.—A pruning school was held at the college the second week in December, with lectures and demonstrations in the forenoons of each week and pruning work in the nearby orchards in the afternoons. Some work on spraying was also carried on.

A joint antismut campaign has been conducted by the departments of botany, plant pathology, and farm crops, in cooperation with the U. S. Department of Agriculture as part of the plan to increase food production.

Ava B. Milam, head of the domestic science department, has been appointed dean of the school of home economics. Ralph McBurney, instructor in bacteriology, has been commissioned first lieutenant in the Sanitary Corps of the Army Medical Department. Chas. S. Brewster, of the Purdue University and Station, has been appointed instructor in poultry husbandry, vice A. C. McCulloch, now engaged in extension work in New Brunswick.

Other appointments include V. D. Chappell, instructor of dairy manufactures at the Iowa College, as assistant in dairy manufactures; L. W. Wing, as instructor in dairying; D. K. Tressler, of the Bureau of Soils of the U. S. Department of Agriculture, and E. H. Dougherty as instructors in agricultural chemistry; Bernard F. Sheehan as instructor in farm crops; L. F. Lingle as assistant professor and assistant in horticultural products; H. C. Woodham as instructor in horticulture; and E. J. Fjeldsted as instructor and assistant in animal husbandry, vice G. R. Samson.

Pennsylvania College and Station.—Plans have been approved for a commercial truck garden of about 10 acres. The work is to be done by students and is intended to afford an insight into commercial truck operations.

R. A. Andree, assistant professor in agronomy in charge of farm economics, has resigned to become head of the department of agricultural engineering at the Texas College. C. M. Arthur has resigned as instructor in agricultural extension to take up work connected with problems of distribution and marketing of farm products carried on with the Pennsylvania Committee on Public Safety. Dr. H. L. Fulmer, assistant professor of bacteriology, is now in military service. L. P. McCann, instructor in animal husbandry, resigned January 1, 1918.

Dr. D. S. Fox, assistant in farm management at the Montana Station, has been appointed assistant professor of farm management. Other appointments include E. L. Nixon as extension plant pathologist, C. A. Hunter as assistant professor of bacteriology and assistant bacteriologist, M. W. Lisse as assistant professor of agricultural chemistry, E. J. Klepper as assistant in botany, Chas. Cummings as instructor in dairy husbandry, and E. J. Holben as assistant in experimental agronomy.

Texas College and Station.—At the special session of the legislature, the acts establishing a West Texas Agricultural College and a Northeast Texas Junior A. and M. College were repealed. The John Tarleton Agricultural College at Stephenville and the Grubbs Vocational College at Arlington, junior colleges under the board of directors of the Texas A. and M. College, opened September

E. E. Binford; superintendent of the Beeville substation, became professor of agriculture in the John Tarleton College and was succeeded by I. E. Cowart, previously assistant professor of horticulture.

F. D. Fuller, formerly chief deputy State chemist of Indiana and more recently in commercial work, has been appointed chief of the division of feed control service. W. E. Jackson became assistant entomologist of the station, October 1, 1917, for work in combating foul brood. Dr. H. Schmidt, veterinarian, and Carl Abell, scientific assistant and station illustrator, are now in military service, the latter being succeeded by Miss Edith H. Phillips.

Virginia Truck Station.—A 75-acre farm in Accomac County has been rented for the use of the station in conducting experiments on sweet potatoes, Irish potatoes, strawberries, and other truck crops grown in the county. The farm will be equipped with modern buildings and operated for experimental purposes.

Albert White, instructor in horticulture at the Pennsylvania College, has been appointed assistant horticulturist, assuming his duties November 15.

Wyoming University and Station.—Dr. H. G. Knight, dean of the college of agriculture and director of the station, has accepted the corresponding position at the Oklahoma College and Station, effective February 1, and has been succeeded by A. D. Faville. Dr. H. M. Martin, assistant in animal diseases, is now in military service.

Society for the Promotion of Agricultural Science.—The thirty-eighth meeting of this society was held at Washington, D. C., November 12 and 13, 1917. The sessions were unusually well attended. The program dealt particularly with war conditions, but covered a wide range of subject matter.

The presidential address was given by Dr. Herbert Osborn at a joint session held with the American Society of Agronomy. Dr. Osborn took for his subject The Outlook in Agricultural Science, discussing some of the notable developments in various lines and some effects of the war upon agricultural science. He pointed out that when the war emergency arose, it found a great body of trained workers already mobilized, in whom the public had confidence and whose recommendations were accordingly widely followed. The outlook for financial support of agricultural institutions he characterized as unusually favorable. The prospective shortage of younger workers he suggested might be lessened to some extent by the retention in service of older men who would otherwise seek retirement. Since the immediate duty of agricultural science, as of all other interests, is to win the war, all efforts should be energetically set forth in this specific direction.

At the same session Dr. L. H. Bailey delivered an address of wide general interest entitled Permanent Agriculture and Democracy. This address was suggested by his observations of the agricultural situation in China, where 85 per cent of the people are engaged in agriculture but under a scale of living which he characterized as reduced to the lowest possible terms. On the basis of his observations he discussed such fundamental questions as the farmer's place in the Nation as the "keeper of the earth," the need of broad vision as well as specialized knowledge on the part of those attempting to advise on rural problems, the fallacy of too small holdings and overintensive methods, and the real difference between "permanent" and "stationary" agriculture.

The program of technical papers was as follows: The Function of Organic Matter in the Maintenance of Soil Fertility, by C. E. Thorne; How Farmers Acquire Their Farms, by W. J. Spillman; Vegetation Experiments on the Availability of Treated Phosphates, by J. G. Lipman; Wheat Production and Consumption during Peace and War Times, by H. Snyder; Shall We Recommend

the Use of Magnesium Limestone? by A. G. McCall; A Revolution in the Methods and Theories of Soil Chemistry, by C. B. Lipman; Abortiveness As Related to Position in the Pod of the Ovules of the Legume, by B. D. Halsted; The Station's Part in Winning the War, by B. Youngblood; Have the Agricultural Colleges Met Their Obligations in the War Emergency? by W. D. Hurd; The Most Pressing Development Problem of American Agriculture, by C. V. Piper; Some Factors of Success and Failure in Dry Farming, by A. Kezer; Some Results Obtained in the Use of Sulphur As a Fertilizer, by A. B. Cordley; Promoting Practical Forestry Work, by F. W. Rane; Inosit Phosphoric Acid in Feeding Stuffs, by J. B. Rather; The Mineral Metabolism of the Milch Cow, by E. B. Forbes; Influence of Degree of Fatness on Utilization of Feed by H. P. Armsby and J. A. Fries; and A Prospective New Forage Crop for the Irrigated Portion of the Northwest, by F. B. Linfield.

At the business session the secretary, Director C. P. Gillette, reported that a canvass of members as to the enrollment in the society of members of the American Society of Agronomy and the American Farm Management Association and the formulation of a joint program had resulted in an affirmative vote of 47 to 39. In accordance with the results of this canvass, the executive committee was instructed to work out details for such a plan of reorganization and report at the next annual meeting.

Dean R. W. Thatcher was chosen vice-president of the society, the remaining officers being reelected.

Miscellaneous.—The death is noted of Dr. Arthur T. Neale, director of the Delaware Station from its organization in 1888 until 1906 and in charge of agronomy and animal husbandry work until 1907. Dr. Neale was 65 years of age, a graduate of Wesleyan University and the University of Halle, and served as assistant chemist in the laboratories of both institutions. He was also chemist of the New Jersey State Station from 1880 to 1888.

Dr. C. H. Higgins, chief pathologist of animals branch of the Canadian Department of Agriculture since 1902, has resigned to engage in commercial work in New York City, and has been succeeded by Dr. S. Hadwen, previously in charge of the veterinary research laboratory of the department in British Columbia.

T. B. Wood, professor of agriculture in the University of Cambridge, has been appointed to the Development Commission of Great Britain, vice A. D. Hall, now secretary of the Board of Agriculture and Fisheries.

The senate of the University of London has decided to institute for nonresident students a B. S. degree for courses dealing with the administration and management of urban and rural lands and estates.

A. C. Monahan, specialist in agricultural education and rural school administration of the U. S. Bureau of Education, has been commissioned major in the Sanitary Corps of the National Army.

W. V. Tower has resigned as director of the Porto Rico Insular Experiment Station at Rio Piedras.

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INDEX OF SUBJECTS.

NOTE.—The abbreviations "Ala.College," "Conn.State," "Mass.," etc., after entries refer to the publications of the respective State experiment stations; "Alaska," "Guam," "Hawaii," and "P.R.," to those of the experiment stations in Alaska, Guam, Hawaii, and Porto Rico; "Can.," to those of the experiment stations in Canada; and "U.S.D.A.," to those of this Department.

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